THE IRON AGE

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Pig Iron Production Shrinks

Better Demand for Steel Bars

Some Rail Orders Coming Out

Our reports from blast furnaces, covering operations in the month of May, show a further reduction in the output of pig iron. The restriction of operations thus continues. Our figures show that the total make of coke and anthracite pig iron in May was 1,893,456 gross tons, or 61,079 tons a day, against 2,065,086 tons in April, or 68,836 tons a day. Quite a number of furnaces were blown out during the month, but some of these merely went out for repairs and may be expected to be in operation shortly. Several furnaces connected with steel plants were blown in, indicating that the production of pig iron for steelmaking may slightly increase. The number of furnaces in operation June 1 was 203, against 212 on May 1. The United States Steel Corporation had in operation at the beginning of this month 63½ per cent. of its blast furnace capacity. This is about the rate of production which has prevailed for some time, indicating uniformity in the operations of the corporation's works as a whole, this being accompanied by no accumulation of stocks of pig iron.

Manufacturers of cold-rolled steel shafting have followed the example of the makers of steel bars, reducing their discounts to 60 per cent. off in carloads and 55 per cent. off in smaller lots, delivered in base territory. Makers of boiler and structural rivets have also lowered their prices to correspond with steel bar prices.

The steel bar trade shows some improvement as a result of the recent reduction in prices. A considerable tonnage of steel bars was placed last week with the leading manufacturers on the new basis by agricultural implement makers and other large consumers who contract at this time for their supply for the twelve months beginning July 1.

Other lines in which price reductions were made do not show much improvement in business, yet the week has not been a bad one. Among orders placed for new projects involving structural material were 6000 tons for a department store at Newark, N. J.; 1200 tons for the new building of the American Express Company, New York; 2400 tons for the by-product coke oven plant at South Bethlehem, Pa.; 5932 tons for the Otis Bank Building, Chicago. The fabricating contract for the Hotel Statler, Cleveland, 4000 tons, has at length been placed.

Rail orders are somewhat better. The Baltimore & Ohio Railroad has bought 23,050 tons, taking 13,050 tons from the several mills of the United States Steel Corporation, 7500 tons from the Cambria Steel Com-

pany, and 2500 tons from the Bethlehem Steel Company. The Missouri Pacific-Iron Mountain system has bought 25,000 tons from the Colorado Fuel & Iron Company for delivery within two months, and a further purchase of 25,000 tons is under consideration. Other important rail inquiries are in the market, including one from the Harriman system for 40,000 tons.

The American Sheet & Tin Plate Company has completed part of its new large plant at Gary, Ind., and satisfactory test runs have been made.

Among new business now coming up is the requirement of steel plates for the ten new torpedo boats, amounting to 5000 tons. The two new revenue cutters will take 2000 tons. A large steel company at Pittsburgh is the low bidder on 4000 tons of plates and 1500 tons of shapes for the collier Jupiter, to be built at the Mare Island Navy Yard. The Williamsburg Bridge, New York, will require 4000 tons of steel for reinforcement and for tower construction. Bids are now in for the great Hell Gate Bridge, New York.

The pig iron market shows little change in demand as prices are not as firm as they should be, and under such conditions consumers naturally wait for developments. The production is now so much under the rate of three months ago that it must be close to if not under the consumption. In the last half of May stocks of pig iron at independent furnaces in western Pennsylvania decreased 13,000 tons.

An event of great importance is the advance of pig tin in London to the highest price ever known. It is within ¾c. per lb. of the highest price ever reached in New York.

The Application of the Anti-Trust Decisions

The Supreme Court decisions in the Standard Oil and American Tobacco cases show clearly that the mere bigness of a corporation is not in itself to be considered a violation of the Sherman anti-trust act. This is an important point upon which the judgment of the public appears to have been at fault. The Sherman anti-trust act grew out of the fear that industrial and commercial organizations were being formed by agreement among competitors which would completely control their respective branches of business and that the consumer would then be forced to pay exorbitant prices or be limited to but one source of supply for a necessity. The Sherman law was enacted expressly to check such a disposition among business interests and it did so to some extent. So much respect was paid to it by those who felt absolutely impelled to reduce competition in their lines that they turned from merely making trade agreements to the formation of large corporations which absorbed as many competing concerns as was possible or desirable. Greater corporations were thus created after the enactment of the Sherman law than had been in existence or even dreamed of prior thereto. These corporations the public has regarded as trusts indiscriminately and as violators of the law because of their great size.

The Supreme Court has shown by these decisions that a big corporation stands or falls according to its methods. The two corporations ordered to be dissolved or reorganized have been found guilty of improper actions, of conducting their business in a manner which constitutes a violation of the spirit of the Sherman law. The question which concerns quite a number of large corporations in the various trades with which *The Iron Age* is identified is how they shall conduct their business so that they may not fall under the ban of the law as have the Standard Oil and American Tobacco companies. Announcements have come from Washington that while the Department of Justice will not conduct a crusade against large corporations it proposes to continue its activity in endeavoring to punish all corporations and their officers who appear to be violating the law. The way seems clear, in the light of the decisions, for large corporations to avoid subjecting themselves to the pains and penalties of the law and even to clear themselves from any unpleasant attention by the Department of Justice. This is to conduct their business with a wholesome respect for the law and not with any attempt to evade it.

The Sherman anti-trust act is evidently here to stay. Neither its enemies nor its friends are likely to be able to amend or reconstruct it. It has been interpreted by the highest court in such a way that no violator is financially so strong or politically so powerful as to be able to avoid it, while the way has been pointed out for great interests to proceed in the conduct of their business without harassing attention from the officers of the law. It is therefore the plain duty of every large interest to conduct its business in the straight and narrow path.

Record Iron and Steel Exports

New records are being made in all the general classes of iron and steel exports. The sharp increase which has recently occurred in exports of the tonnage lines of iron and steel is generally appreciated, but it is not so widely known that in agricultural implements and general machinery new records are also being made. The increase in the tonnage lines is lightly ascribed to the efforts of the United States Steel Corporation, and the inference is probably sometimes drawn that were it not for its position and policy no special development in the matter of exports would be observed at this time. When it is perceived that exports of other iron and steel products are this year exceeding previous records by approximately one-fourth, it becomes apparent that, whatever may be the particular influence in the case of the tonnage products, the movement toward heavier exports is general.

Before considering the machinery and other fabricated lines a glance may be taken at the tonnage lines. In the following table are shown the exports of the tonnage lines for the past seven years, since prior to 1904 the exports were, as a rule, much lighter, until then being made up chiefly of pig iron and unfinished steel. To the seven years has been added an estimate for 1911, based on the four months so far reported. The figures cover scrap, pig iron, unfinished steel and finished rolled steel such as structural material, plates, bars, sheets and pipe, together with wire, nails, etc.

Iron and Steel Exports, Gross Tons.

1904	1,167,710	1908	964,266
1905	1,010,255	1909	1,239,708
1906	1,325,740	1910	1,535,693
1907	1,301,979	1911	2,240,000*

*Three times the total for the four months reported.

The exports in the first four months of this year were one-half greater than the average rate of last year, and more than double the average in 1904 and 1905. The actual exports in the four months of this year were as follows:

	Gross tons.		Gross tons.
January	152,140	March	215,667
February	150,702	April	227,832

For several years prior to 1910 the exports averaged approximately 100,000 tons per month, the exports in 1910 averaging 125,000 tons a month, so that the sharp increase in recent months is readily apparent. The April exports were approximately 125 per cent. in excess of the average prior to last year.

The declared value of the above tonnage exports has been as follows:

1904	$42,551,109	1908	$43,397,323
1905	42,104,348	1909	50,783,138
1906	52,215,089	1910	63,276,714
1907	60,046,221		
January, 1911	$6,243,064	March, 1911	$7,443,241
February, 1911	5,845,972	April, 1911	8,696,136

The monthly average prior to 1910 was a trifle over $4,000,000, while the April exports were slightly more than double this, indicating that there has been nearly as great an increase in value as there has been in tonnage. The total for the four months of this year was $28,228,413, or at the rate of $85,000,000 a year, indicating a large gain over any previous year. If there has been any considerable decrease in the unit value of the lines exported, this has been fully compensated by the exports being made up more largely of the more finished products.

The value of the other products classed in the government returns as "iron and steel" but outside of the tonnage lines just referred to, and made up of hardware, cutlery, machinery and parts of machinery, etc., has been as follows:

1904	$86,002,504	1908	$107,715,791
1905	100,824,165	1909	106,897,193
1906	120,340,499	1910	137,995,189
1907	137,020,560		
January, 1911	$12,496,897	March, 1911	$15,148,607
February, 1911	12,844,820	April, 1911	16,220,920

These exports have fluctuated widely, but as 1907 and 1910 showed substantially the same total, while intermediate or preceding years showed smaller totals, it may be inferred that there has not recently been a definite tendency toward an increase, but whereas the monthly average in the two record years, 1907 and 1910, was $11,500,000, January and February last showed a gain of 10 per cent. over this average, March a gain of 30 per cent. and April a gain of more than 40 per cent.

In agricultural implements, which the government returns do not classify as iron and steel, but which are distinctly an iron and steel proposition, exports have been at record rates this year. Inasmuch as these are more or less seasonable goods it might be misleading to compare the results of the first four months of this year directly with the averages of preceding years, and a comparison will therefore be made to show that last year was a record year, another comparison then showing that the first four months of this year have greatly surpassed the record of the corresponding months of last year. Exports of agricultural implements have been as follows in the past seven years:

1904	$21,654,892	1908	$25,264,939
1905	22,124,312	1909	27,327,428
1906	24,744,762	1910	31,291,351
1907	25,597,272		

Thus the value of agricultural implement exports last year exceeded the best previous year by nearly 15 per cent. and the average of the preceding five years by more than 30 per cent. Exports in the first four months of this year compare with these in the same months of last year as follows:

	1910.	1911.
January	$3,230,249	$4,208,316
February	3,728,778	3,537,036
March	3,769,847	4,890,047
April	3,034,348	5,476,750
Four months	$13,763,222	$18,112,149

The increase from the four months of last year to the four months of this is 32 per cent., and on this basis it may be inferred that the exports this year have been at a rate of 70 per cent. in excess of the rate in the five years 1904-8 inclusive.

Thus there is this year a large increase in exports of the three lines, tonnage commodities, machinery, etc., and agricultural implements. In a nutshell, the exports of these three lines in the four months of this year have been at the rate of $310,000,000 a year, over 30 per cent. in excess of the exports in 1910, and more than 50 per cent. in excess of the exports in the few years preceding 1910.

Exports of all merchandise have not been increasing this year, the total exports being valued as follows:

January	$197,069,111	March	$158,670,956
February	175,945,805	April	158,008,093

The exports of iron and steel products, including agricultural implements, amounted in April to $30,393,806, or 19.2 per cent. of the total exports. This is really an excellent record. While there has been much advice given recently that this country "must get on an export basis" it appears that without making any particular effort to change fundamental conditions the producers of iron and steel, and the domestic manufacturers using these products, have been getting more on an export basis by the simple process of selling more export goods.

Intensive Production

It is a matter of pride with many firms to be able to boast that there is not a single article in their line which they are not prepared to manufacture. "Orders! More orders!" they cry, and the salesmen with such exhortations ringing in their ears are led into believing that increased volume of business at any cost is what is most desired by their employers. Accordingly, any good sized order is considered acceptable, provided the selling price has not been cut ruinously, with the result that the list of articles manufactured by the firm swells enormously, the works become crowded with both new and obsolete tools, and the "new machinery account" attains astonishing proportions. The practice is considered very good business by many firms who have proved themselves quite successful.

Here and there, however, an establishment is to be found which appears to hold an entirely different opinion as to the wisdom of manufacturing on such a wide scope. Such firms are like the medical specialist of modern times; all his energies have been expended and plans laid with the attainment of a highly developed equipment for one specific line as the one aim and purpose. Not a little shrewdness and boldness is demanded in the choice of such a business policy: shrewdness, because the wisdom of the thing has been seen in advance of competitors; boldness, because of the risk to be taken, the putting of all the eggs in one basket. Many will question the wisdom of taking the risk. Our world is made up of both radicals and conservatives—of "the pushers and the pushed"— and there will be few who will deny that progress is other than the fruit of the radical mind brought to maturity under the calm eye of the conservative. Where once we walked, now we ride—and fly.

A firm can be cited which ten years ago, employing several hundred hands, took orders for anything from wood screws to lamp burners, just as do a thousand other firms today. A change in the personnel of

its management was responsible for a change in policy from one extreme to the other. This new policy called for specializing, and specializing on those things which would mean the greatest returns on money invested. A study of its market showed what those things were. Machinery was then built and processes were devised to cut production costs and to intensify the production of those few widely used articles. As much business was then secured as would keep the shop running to its fullest capacity and at a handsome profit. It is, however, more necessary with intensive, specialized production to keep ahead of all competitors in the matter of low production costs. To succeed permanently, such a manufacturer must be among the best at the game. But the game is well worth the candle.

Neither a long nor a vehement argument is needed to convince one that it is not the number of orders, not the volume of business, alone that counts. Every bit of business taken at a meager profit may mean the tying up of productive machinery at the expense of other business which would bring a more generous profit. Although the former may not mean an actual loss, it certainly means less profits at the year's end; whereas, with a firm whose plant is run on the specialized output plan, preference is given to that business which is known to bring maximum returns. The trained skill of the entire productive force is then concentrated in the endeavor to make that return greater day by day.

Higher Machine Tool Prices

The reports of the past two months that the price of machine tools was to drop were without foundation in fact. The tendency will be upward rather than downward, and when the revival of business comes prices will be increased very materially, according to the plans of the builders. Conditions justify this action.

Machinery lists are as they were at the high point of production four or five years ago. In some cases they are higher. The prices were created under the influences of prosperous business. At that time each manufacturer sought to put his business on a normal money-making basis. This had until then been impossible because of the bitterness of competition which had existed before the National Machine Tool Builders' Association had brought the manufacturers together periodically for the purpose of talking over their differences and softening asperities. Competition was led into legitimate channels. As a consequence of the new relationship in the trade even the influence of a complete reaction from good to bad times failed to bring with it the cutting of prices, except in somewhat isolated cases. Relations within the trade have not been seriously strained. The occasional announcement of an advance in prices by individual manufacturers has served to stiffen the situation.

Machine tool prices should be higher, if the manufacturer is to retain the margin of profit which was established in 1906-1907. Since then machinery has been much improved. Competition has impelled the addition of fixtures and appurtenances which make equipment more convenient of operation, besides giving it a larger scope of usefulness. Modern methods of manufacture have brought heavier construction in machinery. The cost of labor is no less, materials are but slightly lower and overhead charges are not shrinking. Consequently an advance in prices will follow a revival of trade.

The Steel Corporation Buys Coal Lands

An important deal has about been closed whereby the United States Steel Corporation, through the H. C. Frick Coke Company, secures some 8,000 acres of coking coal land and 956 coke ovens belonging to the Pittsburgh Coal Company, the coke ovens having been operated under the name of the Colonial Coke Company. The Steel Corporation has also secured about 8000 acres of coking coal lands formerly operated by the Monongahela River Consolidated Coal & Coke Company. It is said to have paid about $1750 per acre for the 8000 acres bought from the Pittsburgh Coal Company, this price also including the 956 coke ovens; and is reported to have paid about $900 per acre for the 9000 acres bought from the Monongahela River Company. The properties are to be paid for in 35-year 5 per cent. bonds. The transaction will remove the Colonial Coke Company as a seller of coke in the open market. This company has been operating its ovens practically full for some months, and has been selling its surplus furnace coke in the open market at relatively low prices. The growing scarcity of good coal lands in the Pittsburgh district is given as the reason of the purchase. The Pittsburgh Coal Company will still have about 150,000 acres of good coal lands in the Pittsburgh district.

On Monday next the Pittsburgh offices of the McClintic-Marshall Construction Company, steel fabricator, will be removed from the Park Building to rooms 1218-1224, inclusive, Oliver Building, Smithfield street. On the same date the contracting and treasury departments will also be removed from Rankin, Pa., where the company operates a large plant, to the new offices in the Oliver Building.

The machine shops of the Caledonia Railway Company, St. Rollox, Scotland, are lighted by an installation of compressed gas, 112,000 candle-power being required. A pressure of 54 in. of water is obtained by rotary compressors. The inverted lamps vary from 60 to 1500 candle-power per single burner, and are said to have an efficiency of 60 candle-power per cubic foot of gas, a result due not only to the high pressure, but also to a preheating device by which the gas and air mixture is warmed before entering the burner.

The Pittsburgh Piping & Equipment Company, Thirty-fourth and Smallman streets, Pittsburgh, is now shipping the material required for piping up the new two blast furnaces of the Iroquois Iron Company, South Chicago, Ill., consisting of 20-in. cast iron pipe for underground work, cast steel valves and fittings, and steam exhaust and riveted steel piping up to 72-in. diameter, with all connections to the blowers. The material and workmanship were specified to be of the highest grade. This company also recently completed a high-pressure piping installation of 2000 hp. in a cement plant in Tennessee.

The American Lead Company has moved its general offices from 3112 Penn avenue, Pittsburgh, where its plant still remains, to 508-509 Diamond Bank Building. This company makes lead, tin and chemical pipe, wire solder, art glass lead, lead drum traps, the American lead trap with reinforced vents and drains, etc., and is now operating its plant day and night.

The Pittsburgh White Metal Company, 3112 Penn avenue, Pittsburgh, manufacturer of babbitt and anti-friction metals, making a specialty of babbitt for armature bearings, has removed its offices to rooms 508-509 Diamond Bank Building, Pittsburgh. It is operating its plant to good capacity.

The Strauss Bascule Bridge Company, 901 Fort Dearborn Building, Chicago, Ill., has been awarded the contract for the construction of a 235-ft. single leaf double track bridge over the Calumet River at South Chicago, Ill., for the Baltimore & Ohio Railroad. The city of Quebec, Canada, has also placed an order for a 150-ft. single leaf highway bridge over the St. Charles River.

Personal

W. R. Anderson has resigned as general manager of the Anderson Forge & Machine Company, Detroit, Mich., taking effect June 1. He has been connected with the company since its organization as manager. W. T. Howell, who for the past two years and a half has been connected with the company in the capacity of general superintendent, has been promoted to the position of general manager. Mr. Anderson retains his interest in the company and will remain on the board of directors. He is not prepared to make public his plans for the future, but will take a vacation of about a month.

Fred McFawn has severed his connection with the Watrous Mfg. Company and associated himself with the Stanley Works, New Britain, Conn., traveling from the Western office, 73 Lake street, Chicago, and paying special attention to steel stampings.

Horst Peltz, general manager of the German Garbe Boiler Works, is now in this country to arrange for the manufacture of the Garbe boiler in the United States. He makes his headquarters with the Wiener Machinery Company, 50 Church street, New York City.

Edward G. Elcock, president of the Hansell-Elcock Company, structural steel fabricator, Chicago, and Mrs. Elcock were the victims of an automobile accident last week. While on their way to the Indianapolis Decoration Day races their car was wrecked, Mrs. Elcock being seriously injured internally and Mr. Elcock breaking his arm. They are now at a Chicago hospital.

The recent death of Alexander E. Brown, founder, president and general manager of the Brown Hoisting Machinery Company, Cleveland, Ohio, has resulted in several changes in the officers of that company. Harvey H. Brown, formerly vice-president and treasurer, and a brother of Alexander E. Brown, has been elected president. Alexander C. Brown, son of the former president, has been made vice-president. George C. Wing remains secretary. Charles T. Pratt, formerly assistant treasurer, becomes treasurer. Richard B. Sheridan has been made general manager.

The Penn Steel Castings & Machine Company, Chester, Pa., at a meeting of the board of directors held May 12, elected Walter S. Bickley president, succeeding Mortimer H. Bickley, deceased.

George K. Hamfeldt has resigned as general manager of the blast furnace department and as consulting engineer of Les Petits Fils de F. de Wendel & Cie., of Germany, effective July 1. He was for a number of years connected with the Carnegie Steel Company and later, as general manager of the Midland Steel Company, Pittsburgh, Pa., built its plant at Midland, Pa.

C. P. Craine, who has represented the Buhl Sons Company, Detroit, Mich., in the Michigan territory for a number of years, has become connected with the Pittsburgh Shafting Company, Detroit, and now represents the latter company in the same territory.

Albert A. Bialas, formerly with the Midland Steel Company and later a salesman for the S. Jarvis Adams Company, Pittsburgh and Midland, Pa., will hereafter be associated with the Columbia Steel & Shafting Company as special sales representative. The Columbia Steel & Shafting Company's general offices are in the Empire Building, Pittsburgh, Pa.

J. Friedenstein, director of William Cooke & Co., Ltd., Sheffield, England, whose American representatives are John Helmuth & Co., 30 Church street, New York, is at present at the Hotel Astor, New York. Mr. Friedenstein, who manages the foreign and colonial business for his company, is en route around the world looking after the interests of his company in this country, Australia, New Zealand and South Africa.

J. B. Shacklock, senior member of the firm of H. E. Shacklock, Ltd., manufacturer of stoves and ranges, Dunedin, New Zealand, accompanied by his son, H. A. Shacklock, and the Rev. D. J. Murray, are making a tour of the United States, en route for England. Mr. Shacklock is visiting the plants of the various manufacturers of foundry and machine shop equipment with the object of improving the efficiency of his own works. Mail addressed to 64 Parker street, Derby, England, will reach him before his return home.

W. H. Hegmann, 911 Oliver Building, Pittsburgh, Pa., has accepted the agency for western Pennsylvania of John Hy. Andrew & Co., Ltd., Sheffield, England, on high-grade high-speed and carbon steels, which are known as Toledo (Sheffield) tool steels. Mr. Hegmann has had some twenty-four years of tool steel mill experience in the Pittsburgh district with the Crescent Steel Company and Firth-Sterling Steel Company as superintendent.

F. G. Haldy, formerly superintendent of the door check and hoist departments of the Yale & Towne Mfg. Company, Stamford, Conn., has accepted the position of superintendent of the Whitlock Coil Pipe Company, Hartford, Conn.

Phillips Isham, of Nash, Isham & Co., pig-iron merchants, New York, has gone on an extended Western trip, including California and Alaska.

W. L. Saunders, president of the Ingersoll-Rand Company, 11 Broadway, New York, has been elected a director of the International Harvester Company.

B. S. Harrison, London, England, representing Sota & Aznar, producers of Spanish iron ore, who has been in this country since May 13, returned to England June 3.

H. A. Berg has resigned as superintendent of the blast furnace of the Midland Steel Company, Midland, Pa., effective June 1. This plant is now owned by the Pittsburgh Crucible Steel Company, an identified interest of the Crucible Steel Company of America.

Obituary

JOHN J. SPEARMAN, Sharon, Pa., died May 31, aged 87 years. He was a manufacturer of pig iron for the greater part of his life. Born at McKee's Gap, Blair County, Pa., his first employment was at blast furnaces in that vicinity. In January, 1847, he was placed in charge of Schoenberger, Agnew & Co.'s furnace at Sharon. In 1853 he purchased the Mazeppa furnace near Mercer, Pa., which he operated until 1859, when he became manager of the furnace at Sharpsville, Pa., owned by James Pierce, retiring from that position in 1862 to become manager for James Wood & Sons, Wheatland, Pa., and subsequently securing an interest in the firm. In 1872 he organized the Spearman Iron Company, Sharpsville, Pa., and managed that company until its property was taken over some years ago by the Shenango Furnace Company. At the time of his death he was president of the First National Bank, Sharon, Pa., and had held that position for 39 years.

JAY H. KEYES, recently retired from the presidency of the Standard Wheel Company, with plants at Indianapolis and Terre Haute, Ind., died May 26 at Terre Haute, aged 52 years.

JOHN D. HOOKER, who resigned from the vice-presidency of the Baker Iron Works, Los Angeles, Cal., last year, died at his home in that city May 24, aged 75 years. Since retiring from active business he had been engaged in philanthropic and scientific work.

SIMON PERKINS, Sharon, Pa., a retired pig iron manufacturer, died May 27, aged 72 years. He was largely interested in local manufacturing, railroad and banking operations. He leaves four children.

"The Spontaneous Combustion of Coal with special Reference to Bituminous Coals of the Illinois Type," by S. W. Parr and F. W. Kressmann, has just been issued as Bulletin No. 46 of the engineering experiment station of the University of Illinois. The bulletin describes a series of experiments directed toward the determination of the fundamental causes underlying the spontaneous combustion of coal. These causes may be summarized as follows: 1. External sources of heat, such as contact with steam pipes, hot walls, and the impact of large masses in the process of unloading, height of the piles, etc. 2. Fineness of divisions. 3. Moisture. 4. Activity of oxidizable compounds, such as iron pyrites. A historical review of the literature upon the spontaneous combustion of coal is given in the appendix. Copies of this bulletin may be obtained gratis upon application to W. F. M. Goss, Director of the engineering experiment station, University of Illinois, Urbana, Ill.

Thomas A. Edison announces that he has perfected a storage battery for motor cars or vehicles of any kind which can be recharged in three or four minutes and will have a life of 50 or 60 miles. He states that it is so small and light that it can be put into a suit case.

Pig Iron Production

May Shows a Further Heavy Decline

Active Capacity Reduced June 1

The output of pig iron in the 31 days of May fell much below the production in the 30 days of April. The total make of coke and anthracite pig iron in May was 1,893,456 gross tons, or 61,079 tons a day, against 2,065,086 tons in April, or 68,836 tons a day. Thus the indications at the beginning of May of a continuation of the decline in production were realized. It is not so clear that the decline in output will continue, as the furnaces connected with steel plants are becoming a little more active than in May.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, beginning with April, 1910, is as follows:

Daily Rate of Pig Iron Production by Months—Gross Tons.

	Steel Works.	Merchant.	Total.
April, 1910	55,663	27,129	82,792
May	52,235	24,867	77,102
June	51,637	23,879	75,516
July	47,183	22,122	69,305
August	46,534	21,429	67,963
September	47,007	21,536	68,542
October	45,794	21,726	67,520
November	41,427	22,232	63,659
December	35,909	21,440	57,349
January, 1911	36,401	20,351	56,752
February	42,349	21,741	64,090
March	48,970	21,066	70,036
April	47,805	21,031	68,836
May	42,270	18,809	61,079

May Output by Districts

The table below gives the production of all coke and anthracite furnaces in May and the four months preceding:

Monthly Pig Iron Production—Gross Tons.

	January. (31 days)	February. (28 days)	March. (31 days)	April. (30 days)	May. (31 days)
New York	136,519	131,238	157,624	139,674	130,927
New Jersey	12,627	6,006	5,869	5,150	9,788
Lehigh Valley	68,324	56,367	69,263	78,182	79,731
Schuylkill Valley	60,592	57,321	67,634	55,305	46,827
Lower Susquehanna and Lebanon Val.	43,942	42,729	46,980	44,537	44,179
Pittsburgh district	409,698	424,517	531,521	488,447	422,000
Shenango Valley	82,922	86,908	109,799	109,239	88,170
West. Penn	94,118	96,616	120,464	100,593	61,892
Maryland, Virginia and Kentucky	56,424	57,759	61,628	60,978	53,271
Wheeling district	77,715	95,571	135,775	119,489	115,213
Mahoning Valley	174,318	201,624	203,006	189,822	187,748
Central and North. Ohio	127,579	144,806	170,914	161,742	152,909
Hocking Valley, Hanging Rock and S.W. Ohio	33,253	32,396	35,173	27,084	27,185
Mich., Minn., Mo., Wis., Col., Wash.	60,941	61,406	69,741	76,379	71,938
Chicago district	165,826	155,498	213,638	236,550	238,424
Alabama	128,188	118,594	143,751	149,737	134,386
Tenn., Georgia and Texas	26,340	25,153	28,331	22,178	28,868
Total	1,759,326	1,794,509	2,171,111	2,065,086	1,893,456

The furnaces blown out in May included one Swede in the Schuylkill Valley; Sheridan in the Lebanon Valley; one Lucy in the Pittsburgh district; Atlantic, Hall and one New Castle in the Shenango Valley; Pulaski and Ivanhoe (banked) in Virginia; Norton in Kentucky; Belmont in West Virginia; one Ohio at Youngstown; Star in the Hanging Rock region; two Mayville in Wisconsin and one Ensley in Alabama. Quite a number of these furnaces, however, were simply blown out for repairs, and they may be expected to be blown in when repairs are completed. The furnaces blown in in May comprised one Eliza in the Pittsburgh district; three Cambria at Johnstown, Pa.; Buena Vista in Virginia, and one Illinois at South Chicago.

Capacity in Blast June 1 and May 1

The following table shows the daily capacity of furnaces in blast June 1 and May 1:

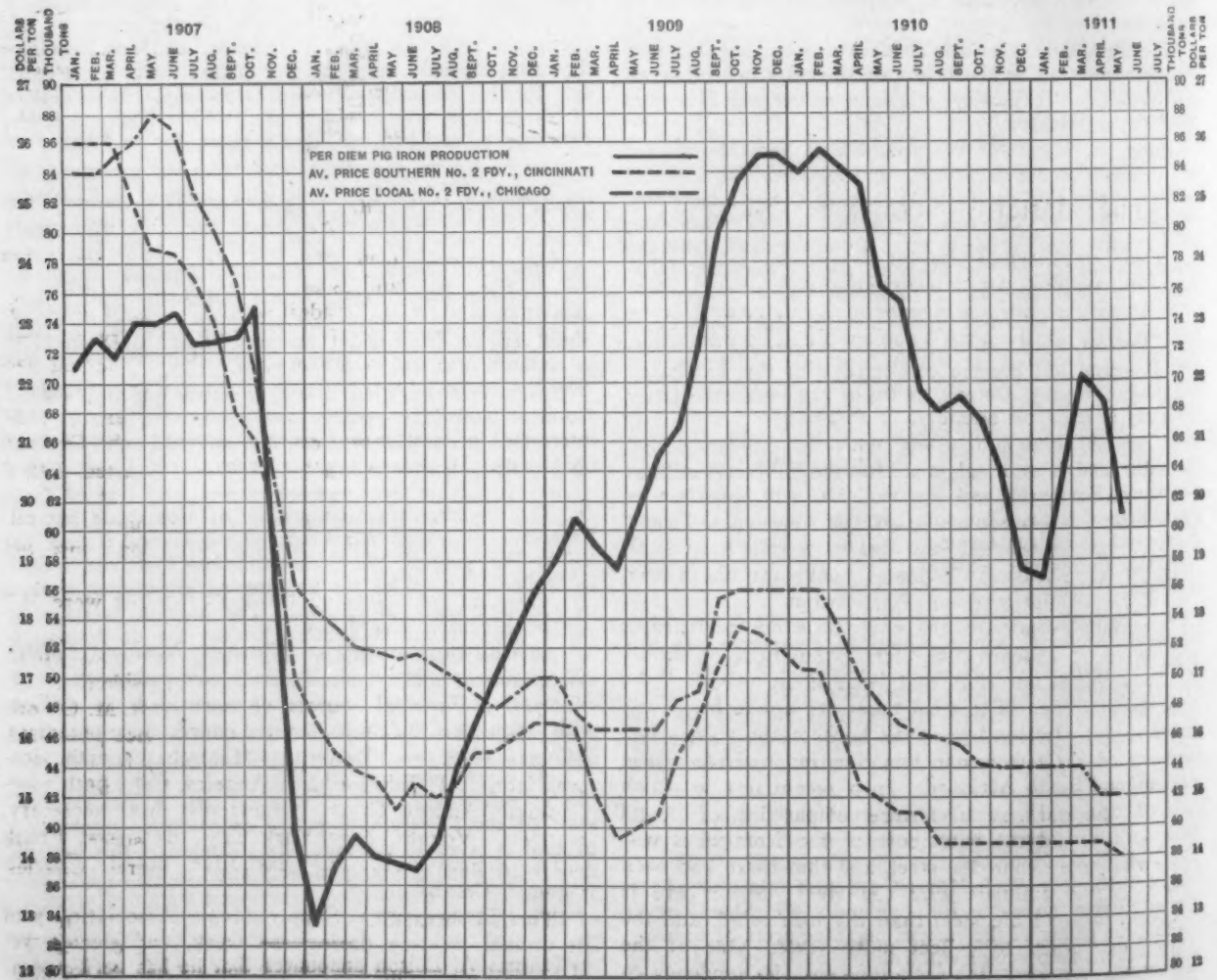

Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to May 1, 1911; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace.

Coke and Anthracite Furnaces in Blast.

Location of furnaces.	Total number of stacks.	June 1. Number in blast.	June 1. Capacity per day.	May 1. Number in blast.	May 1. Capacity per day.
New York:					
Buffalo	17	12	4,049	12	4,327
Other New York	7	1	164	1	164
New Jersey	7	1	183	1	172
Spiegel	2	..	...	..	...
Pennsylvania:					
Lehigh Valley	24	13	2,497	13	2,524
Spiegel	3	1	75	1	82
Schuylkill Valley	16	6	1,429	7	1,810
Low. Susquehanna	7	3	616	3	583
Lebanon Valley	10	5	831	6	862
Pittsburgh district	50	35	14,717	34	14,467
Spiegel	3	1	150	2	273
Shenango Valley	20	8	2,618	11	3,641
West. Penn.	27	9	2,700	6	1,755
Maryland	4	3	728	3	749
Wheeling district	14	10	3,547	11	3,983
Ohio:					
Mahoning Valley	23	15	5,685	16	6,085
Central and North. Hocking Val., Hanging Rock and S.W. Ohio.	22	13	4,932	13	5,082
	15	6	865	7	902
Illinois and Indiana	34	20	7,935	19	7,585
Mich., Wis. and Minn.	10	5	1,029	6	1,455
Colo., Mo. and Wash.	7	4	1,102	4	1,090
The South:					
Virginia	23	6	745	9	972
Kentucky	5	1	81	2	311
Alabama	46	17	4,335	18	4,823
Tenn. and Georgia	20	8	831	7	735
Total	416	203	61,844	212	64,432

Production of Steel Companies

Returns from all plants of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production":

Production of Steel Companies—Gross Tons.

	Pig.—Total production.—			Spiegeleisen and ferromanganese.	
	1909.	1910.	1911.	1910.	1911.
January	1,117,823	1,773,201	1,128,448	19,538	8,360
February	1,073,363	1,620,539	1,185,782	21,396	12,821
March	1,140,553	1,739,212	1,518,063	25,591	11,784
April	1,093,092	1,669,898	1,434,142	22,304	10,657
May	1,256,448	1,619,283	1,310,378	26,529	13,641
June	1,365,527	1,549,112	.....	27,680	.....
July	1,508,762	1,462,689	.....	22,924	.....
August	1,591,991	1,442,572	.....	25,756	.....
September	1,660,839	1,410,221	.....	15,151	.....
October	1,769,094	1,419,624	.....	8,500	.....
November	1,689,994	1,242,804	.....	9,032	.....
December	1,768,799	1,113,174	.....	12,178	.....

Chart of Pig Iron Production and Prices

The fluctuations in pig iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy line are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The two sets of figures are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.

	1907.	1908.	1909.	1910.	1911.
January	71,149	33,718	57,975	84,148	56,752
February	73,038	37,163	60,976	85,616	64,090
March	71,821	39,619	59,232	84,459	70,036
April	73,885	38,289	57,962	82,792	68,836
May	74,048	37,603	60,753	77,102	61,047
June	74,486	36,444	64,656	75,516	.....
July	72,763	39,287	67,793	69,305	.....
August	72,594	43,851	72,546	67,963	.....
September	72,783	47,300	79,507	68,476	.....
October	75,386	50,554	83,856	67,520	.....
November	60,937	52,595	84,917	63,659	.....
December	39,815	56,158	85,022	57,349	.....

Monthly Average Prices in Dollars of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry at Chicago District Furnace Since January, 1907.

	1907.		1908.		1909.		1910.	
	Sou. No. 2, Cin.	Loc. No. 2, Chi.	Sou. No. 2, Cin.	Loc. No. 2, Chi.	Sou. No. 2, Cin.	Loc. No. 2, Chi.	Sou. No. 2, Cin.	Loc. No. 2, Chi.
Jan.	26.00	25.50	16.15	18.10	16.26	17.00	17.25	18.50
Feb.	26.00	25.50	15.75	17.81	16.13	16.40	17.06	18.50
March	26.00	25.75	15.50	17.50	15.05	16.15	16.30	17.80
April	25.06	26.00	15.20	17.38	14.25	16.15	15.37	17.00
May	24.25	26.50	14.75	17.28	14.50	16.15	15.00	16.56
June	24.10	26.25	15.25	17.38	14.70	16.15	14.85	16.25
July	23.85	25.20	15.00	17.20	15.75	16.65	14.75	16.06
Aug.	23.00	24.50	15.25	17.00	16.38	16.78	14.31	16.00
Sept.	21.50	23.75	15.65	16.70	17.35	18.35	14.25	15.90
Oct.	20.95	22.10	15.75	16.50	17.88	18.50	14.25	15.56
Nov.	19.50	20.31	16.00	16.75	17.75	18.50	14.25	15.50
Dec.	17.00	18.55	16.25	17.00	17.45	18.50	14.25	15.50

Jan., 1911, 14.25, 15.00; Feb., 14.25, 15.00; March, 14.25, 15.00 April, 14.25, 15.00; May, 14.00, 15.00.

The Record of Production

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907.— Gross Tons.

	1907	1908	1909	1910
January	2,205,607	1,045,250	1,797,560	2,608,605
February	2,045,068	1,077,740	1,707,340	2,397,254
March	2,226,457	1,228,204	1,832,194	2,617,949
April	2,216,558	1,149,602	1,738,877	2,483,763
May	2,295,505	1,165,688	1,883,330	2,390,180
June	2,234,575	1,092,131	1,930,866	2,265,478
July	2,255,660	1,218,129	2,103,431	2,148,442
August	2,250,410	1,359,831	2,248,930	2,106,847
September	2,183,487	1,418,998	2,385,206	2,056,275
October	2,336,972	1,567,198	2,599,541	2,093,121
November	1,828,125	1,577,854	2,547,508	1,909,780
December	1,234,279	1,740,912	2,635,680	1,777,817

January, 1911, 1,759,326; February, 1911, 1,794,509; March, 1911, 2,171,111; April, 1911, 2,064,086; May, 1911, 1,893,456.

The Master Boilermakers' Meeting

The International Master Boilermakers, Association held its fifth annual convention at Omaha, Neb., May 23 to 25, with 300 members in attendance, representing half of the total membership. The president, A. N. Lucas, Milwaukee, in his opening address, urged a liberal policy in the education of apprentices arguing that it is most profitable to a railroad to develop its own boilermakers and other mechanics. This subject was the chief topic of discussion of the convention. F. W. Thomas, of the Santa Fe Railroad; C. W. Cross, supervisor of apprenticeship of the New York Central Lines, and others went into this most important question. J. D. Farasey, Cleveland, spoke for the American Boiler Manufacturers' Association.

From the report of the committee on steel versus iron tubes, it appears that there is but little to choose between them, but that that little is in favor of the steel boiler tube. The steel tubes are apt to be a little more brittle and tend to break back of the weld when safe-ended. There is not, however, much difference in the mileage to be obtained. In a recent test in which sets of steel and iron tubes were compared it was found that at the end the total cost of the iron tubes was somewhat more than the steel, and that there had been fewer engine failures with the steel. More care is required to weld the steel than the iron tubes, and the steel tubes seem to collect more scale. One of the objections raised to the iron tube was its tendency to split, and cases were given of iron tubes splitting back from 18 to 20 in. from the ends when an attempt was made to roll them out. As a general rule the members was using steel for safe ends, even on iron tubes, though Swedish iron was also used. For the tubes themselves the seamless steel was preferred, both for the service it would render and the ease of welding. As for the difficulty of welding steel, every member who took part in the discussion disclaimed having had any trouble whatever. As for pitting, it was generally conceded that steel tubes pit to a greater extent than iron, and yet a case was cited of a test on the Chicago & Northwestern where a boiler had been fitted with a half set each of steel and iron tubes, and that of these six steel and 49 iron tubes had been scrapped for pitting. On another boiler on the same road just the reverse had occurred.

The time and place of the next meeting were left to the executive board.

Officers were elected as follows: President, George W. Bennett, Albany, N. Y.; first vice-president, J. W. Kelly, Oak Park, Ill.; second vice-president, M. O'Connor, Missouri Valley, Iowa; third vice-president, Thomas W. Lowe, Winnipeg, Manitoba; fourth vice-president, J. T. Johnson, Los Angeles, Cal.; fifth vice-president, Andrew Green, Indianapolis, Ind.; secretary, Harry D. Vought, New York City; treasurer, Frank Gray, Bloomington, Ill.; executive board, Charles Hempel, Omaha.

The Boilermakers' Supply Men's Association had its annual meeting during the week, and elected W. H. S. Bateman, Philadelphia, president; C. A. Caskadden, Chicago, vice-president, and George Slate, New York, secretary-treasurer.

The Iron and Metal Markets

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics.

At date, one week, one month and one year previous.

	June 7 1911.	May 31 1911.	May 3 1911.	June 1 1910.
PIG IRON, Per Gross Ton:				
Foundry No. 2, standard, Philadelphia	*$15.00*	$15.50	$15.50	$17.00
Foundry No. 2, Valley furnace.	13.75	13.75	13.75	15.00
Foundry No. 2, Southern, Cincinnati	13.75	13.75	14.25	14.75
Foundry No. 2, Birmingham, Ala.	10.50	10.50	11.00	11.50
Foundry No. 2 local, at furnace, Chicago*	15.00	15.00	15.00	16.75
Basic, delivered, eastern Pa.	14.50	14.50	15.00	16.25
Basic, Valley furnace	13.10	13.10	13.60	15.00
Bessemer, Pittsburgh	15.90	15.90	15.90	16.90
Gray forge, Pittsburgh	14.15	14.15	14.40	15.40
Lake Superior charcoal, Chicago	17.00	17.00	17.50	18.50
COKE, CONNELLSVILLE, Per Net Ton, at Oven:				
Furnace coke, prompt shipment.	1.45	1.45	1.55	1.70
Furnace coke, future delivery.	*1.70*	1.75	1.75	1.80
Foundry coke, prompt shipment	1.75	1.75	1.90	2.15
Foundry coke, future delivery.	2.00	2.00	2.15	2.25
BILLETS, &c., Per Gross Ton:				
Bessemer billets, Pittsburgh	21.00	21.00	23.00	25.50
Forging billets, Pittsburgh	26.00	26.00	28.00	31.00
Open hearth billets, Philadelphia	23.40	23.40	25.40	29.00
Wire rods, Pittsburgh	29.00	29.00	29.00	31.00
OLD MATERIAL, Per Gross Ton:				
Iron rails, Chicago	*14.00*	14.50	14.25	17.00
Iron rails, Philadelphia	16.75	16.75	16.75	20.00
Car wheels, Chicago	*12.50*	12.75	13.25	15.50
Car wheels, Philadelphia	13.00	13.00	13.00	15.00
Heavy steel scrap, Pittsburgh	13.00	13.00	12.50	15.00
Heavy steel scrap, Chicago	10.25	10.25	11.50	13.50
Heavy steel scrap, Philadelphia.	13.00	13.00	13.00	14.50
FINISHED IRON AND STEEL, Per Pound:	Cents.	Cents.	Cents.	Cents.
Bessemer steel rails, heavy, at mill	1.25	1.25	1.25	1.25
Refined iron bars, Philadelphia	1.27½	1.27	1.32½	1.52½
Common iron bars, Chicago	1.20	1.20	1.25	1.47½
Common iron bars, Pittsburgh	1.25	1.25	1.32½	1.55
Steel bars, tidewater, New York	1.41	1.41	1.56	1.61
Steel bars, Pittsburgh	1.25	1.25	1.40	1.45
Tank plates, tidewater, New York	1.51	1.51	1.56	1.66
Tank plates, Pittsburgh	1.35	1.35	1.40	1.50
Beams, tidewater, New York	1.51	1.51	1.56	1.66
Beams, Pittsburgh	1.35	1.35	1.40	1.50
Angles, tidewater, New York	1.51	1.51	1.56	1.66
Angles, Pittsburgh	1.35	1.35	1.40	1.50
Skelp, grooved steel, Pittsburgh	1.30	1.30	1.30	1.50
Skelp, sheared steel, Pittsburgh	1.35	1.35	1.35	1.60
SHEETS, NAILS AND WIRE, Per Pound:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.00	2.00	2.20	2.40
Wire nails, Pittsburgh†	1.80	1.80	1.80	1.80
Cut nails, Pittsburgh	1.60	1.60	1.60	1.75
Bark wire, galv., Pittsburgh†	2.10	2.10	2.10	2.10
METALS, Per Pound:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	12.45	12.45	12.30	13.00
Electrolytic copper, New York.	12.25	12.25	12.10	12.75
Spelter, New York	**5.55**	5.50	5.50	5.30
Spelter, St. Louis	**5.25**	5.20	5.30	5.15
Lead, New York	4.37½	4.37½	4.42½	4.37½
Lead, St. Louis	4.22½	4.22½	4.27½	4.22½
Tin, New York	**48.25**	45.50	42.00	32.90
Antimony, Hallett, New York	*8.75*	8.95	9.00	8.12½
Tin plate, 100 lb. box, New York	$3.94	$3.94	$3.94	$3.84

Prices of Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 30c.; Birmingham, Ala., 45c. Rates to the Pacific Coast are 80c. on plates, structural shapes and sheets, No. 11 and heavier; 85c. on sheets, Nos. 12 to 16; 95c. on sheets, No. 16 and lighter; 65c. on wrought boiler tubes.

Structural Material.—I-beams and channels, 3 to 15 in., inclusive, 1.35c. to 1.40c., net; I-beams over 15 in., 1.45c. to 1.50c., net; H-beams over 8 in., 1.50c. to 1.55c.; angles 3 to 6 in., inclusive, ¼ in. and up, 1.35c. to 1.40c., net; angles over 6 in., 1.45c. to 1.50c., net; angles, 3 in. on one or both legs, less than ¼ in. thick, 1.40c., plus full extras as per steel bar card effective September 1, 1909; tees, 3 in. and up, 1.40c., net; zees, 3 in. and up, 1.35c. to 1.40c., net; angles, channels and tees under 3 in., 1.40c., base, plus full extras as per steel bar card of September 1, 1909; deck beams and bulb angles, 1.65c. to 1.70c., net; hand rail tees, 2.45c.; checkered and corrugated plates, 2.45c., net.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.35c. to 1.40c., base. Following are stipulations prescribed by manufacturers, with extras to be added to base price (per pound) of plates:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. thick and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square foot, are considered ¾-in. plates. Plates are 72 in. wide must be ordered ¼-in. thick on edge, or not less than 11 lb. per square foot, to take base price. Plates over 72 in. wide ordered less than 11 lb. per square foot down to the weight of 3-16-in. take the price of 3-16-in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Gauges under ¼-in. to and including 3-16-in. on thinnest edge	$0.10
Gauges under 3-16-in. to and including No. 8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including all straight taper plates) 3-ft. and over in length	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Width over 130 in	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inclusive	.50
Cutting to lengths or diameters under 1 ft	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over

TERMS—Net cash 30 days.

Sheets.—Makers' prices for mill shipments on sheets in carload and larger lots, on which jobbers charge the usual discounts for small lots from store, are as follows: Blue annealed sheets, Nos. 3 to 8, U. S. standard gauge, 1.40c.; Nos. 9 and 10, 1.50c.; Nos. 11 and 12, 1.55c.; Nos. 13 and 14, 1.60c.; Nos. 15 and 16, 1.70c. One pass, cold rolled, box annealed sheets, Nos. 10 to 12, 1.65c.; Nos. 13 and 14, 1.70c.; Nos. 15 and 16, 1.75c.; Nos. 17 to 21, 1.80c.; Nos. 22, 23 and 24, 1.85c.; Nos. 25 and 26, 1.90c.; No. 27, 1.95c.; No. 28, 2c.; No. 29, 2.05c.; No. 30, 2.15c. Three pass, cold rolled sheets, box annealed, are as follows: Nos. 15 and 16, 1.85c.; Nos. 17 to 21, 1.90c.; Nos. 22 to 24, 1.95c.; Nos. 25 and 26, 2c.; No. 27, 2.05c.; No. 28, 2.10c.; No. 29, 2.15c.; No. 30, 2.25c. Galvanized sheets, Nos. 10 and 11, black sheet gauge, 2c.; Nos. 12, 13 and 14, 2.10c.; Nos. 15, 16 and 17, 2.25c.; Nos. 18 to 22, 2.40c.; Nos. 23 and 24, 2.50c.; Nos. 25 and 26, 2.70c.; No. 27, 2.85c.; No. 28, 3c.; No. 29, 3.10c.; No. 30, 3.30c. Painted roofing sheets, No. 28, $1.40 per square. Galvanized sheets, No. 28, $2.55 per square for 2½-in. corrugations. All above prices are f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount 10 days from date of invoice.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on wrought pipe, in effect from October 1:

	Steel Black.	Steel Galv.	Iron Black.	Iron Galv.
Butt Weld.				
1 to 1½ in.	..	..	49	43
½ in.	75	63	71	59
¾ to 1¼ in.	79	69	75	65
2 to 3 in.	80	70	76	66
Lap Weld.				
2 in.	76	66	72	62
2½ to 4 in.	78	67	74	64
4½ to 6 in.	77	67	73	63
7 to 12 in.	75	59	71	55
13 to 15 in.	15½	..	..	..
Butt Weld, extra strong, plain ends, card weight.				
⅛, ¼, ⅜ in.	69	59	65	55
½ in.	74	68	70	64
¾ to 1¼ in.	78	72	74	68
2 to 3 in.	79	73	75	69
Lap Weld, extra strong, plain ends, card weight.				
2 in.	75	69	71	65
2½ to 4 in.	77	71	73	67
4½ to 6 in.	76	70	72	66
7 to 8 in.	69	59	65	55
9 to 12 in.	64	54	60	50
Butt Weld, double extra strong, plain ends, card weight.				
½ in.	64	58	60	54
¾ to 1¼ in.	67	61	63	57
2 to 3 in.	69	63	65	59

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

†These prices are for largest lots to jobbers.

THE IRON AND METAL MARKETS

Lap Weld, double extra strong, plain ends, card weight.				
2 in.	65	59	61	55
2½ to 4 in.	67	61	63	57
4½ to 6 in.	66	60	62	56
7 to 8 in.	59	49	55	45

Plugged and Reamed.	
1 to 1½, 2 to 3 in. Butt Weld	Will be sold at two (2) points lower basing (higher price) than merchants or card weight pipe. Butt or lap weld, as specified.
2, 2½ to 4 in. Lap Weld	

The above discounts are for "card weight," subject to the usual variation of 5 per cent. Prices for less than carloads are three (3) points lower basing (higher price) than the above discounts.

Boiler Tubes.—Discounts on lap welded steel boiler tubes to jobbers in carloads are now as follows:

	Steel.
1¾ to 2¼ in.	65
2½ in.	67½
2¾ to 3¼ in.	70
3½ to 4½ in.	72½
5 to 6 in.	65
7 to 13 in.	62½

Less than carloads to destinations east of the Mississippi River will be sold at delivered discounts for carloads lowered by two points for lengths 22 feet and under; longer lengths f.o.b. Pittsburgh. Usual extras to jobbers and boiler manufacturers.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, $29. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days, or 2 per cent. discount in 10 days, carload lots, to jobbers, annealed, $1.60, galvanized $1.90; carload lots, to retailers, annealed $1.65, galvanized $1.95. Galvanized barb wire, to jobbers, $2.10; painted, $1.80. Wire nails, to jobbers, $1.80.

The following table gives the prices to retail merchants on wire in less than carloads, including the extras on Nos. 10 to 16, which are added to the base price:

Fence Wire, Per 100 Lb.								
Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.75	1.80	1.85	1.90	2.00	2.10	2.20	2.30
Galvanized	2.05	2.10	2.15	2.20	2.30	2.40	2.80	2.90

Market and Stone Wire in Bundles, Discount from Standard List.

Bright and Annealed:	
9 and coarser	80
10 to 18	80 and 10
19 to 26	80 and 10 and 2½
27 to 36	80 and 5
Galvanized:	
9 and coarser	75 and 10
10 to 16	75 and 10
17 to 26	72½ and 10
27 to 36	72½
Coppered or Liquor Finished:	
9 and coarser	75 and 10
10 to 26	75 and 10
27 to 36	70 and 10 and 5
Tinned:	
6 to 18	75 and 10 and 10

Pittsburgh

PARK BUILDING, June 7, 1911.—*(By Telephone.)*

Pig Iron.—The market is stagnant, with not a single inquiry of any importance. The average price of basic pig iron for the month of May, based on actual sales, was $13.40, Valley furnace, as compared with $13.75 for April. The average price of Bessemer pig iron for May was $15, Valley furnace, but this was nominal. The consumption of pig iron in the Pittsburgh district is lighter now than it has been for several months. The Clinton Iron & Steel Company's furnace in this city was blown out last Monday and Rebecca at Kittanning, Pa., will be blown out next week. We quote as follows: Bessemer pig iron, $15 nominally; malleable Bessemer, $13.50; basic, $13.10; No. 2 foundry, $13.75; gray forge, $13.25, all at Valley furnace, the freight rate to the Pittsburgh district being 90c. a ton.

Steel.—No sales of any importance have been made either of billets or sheet bars, and inquiry is light. Specifications against contracts are falling off, due to the approaching shutdown toward the close of this month of a number of finishing mills for inventory and repairs. Quotations are as follows: Bessemer and open-hearth billets, 4 x 4 in. and up to, but not including, 10 x 10 in., $21, base, and sheet and tin bars in 30-ft. lengths, $22; 1½-in. billets, $22; forging billets, $26, base, usual extras for sizes and carbons—all prices being f.o.b. Pittsburgh or Youngstown districts, freight to destination added.

Shafting.—Prices on cold-rolled steel shafting have been reduced to 60 per cent. in carloads and 55 per cent. in smaller lots, delivered in base territory.

(By Mail)

As yet the lower prices on the important lines of finished iron and steel that went into effect on June 1 have not resulted in any increase in new demand from consumers, with the possible exception of steel bars, of which a considerable tonnage has been booked the past week by the leading steel bar makers at the official price of 1.25c. It is the general opinion that conditions in the iron and steel trades will continue dull over the next three months, but material improvement is looked for about September, and it is believed that the last three or four months of the year will be fairly active. The pig iron market continues very dull, with prices about stationary and it is not believed that much further decline will take place. The reduction in prices of $2 a ton in billets and sheet bars has not brought about any new inquiry nor do shipments against contracts show any betterment. The coke and scrap trades continue quiet, with very low prices ruling and not much new inquiry.

Ferromanganese.—An inquiry is reported in the market for 1500 tons, 250 tons a month over the last six months of the year, which will probably be closed at about $36.50, Baltimore. Nearly all consumers are covered for the remainder of this year and new inquiry is light. We quote 80 per cent. foreign ferro at $36.50 to $36.75, Baltimore, with a freight rate of $1.95 a ton for delivery in the Pittsburgh district.

Ferrosilicon.—Prices are weak and 50 per cent. ferrosilicon is selling at the lowest prices reached in a long time. We quote 50 per cent. at $52 to $53, Pittsburgh, for delivery through the third quarter; 10 per cent. blast furnace silicon, $22; 11 per cent., $24, and 12 per cent., $25, f.o.b. cars, Ashland and Jisco furnaces.

Muck Bar.—In the absence of sales we continue to quote best grades of muck bar made from all pig iron at nominally $28.50 to $29, Pittsburgh.

Skelp.—We do not hear of any new sales in the past week and prices are only fairly strong, consumers looking for lower figures in view of the lower prices recently made on other forms of finished steel. We quote grooved steel skelp, 1.27½c. to 1.30c.; sheared steel skelp, 1.32½c. to 1.35c.; grooved iron skelp, 1.55c. to 1.60c., and sheared iron skelp, 1.65c. to 1.70c., all for delivery at consumers' mills in the Pittsburgh district, usual terms.

Wire Rods.—New inquiry for wire rods is very light and only for small lots. In fact very few rods are sold in the open market, most consumers making their own supply. We quote Bessemer, open hearth and chain rods at $29 f.o.b., Pittsburgh.

Steel Rails.—On Monday the Baltimore & Ohio Railroad placed an order for 23,050 tons of standard sections, of which 13,050 tons was placed with the United States Steel Corporation, 5000 tons to be rolled by the Carnegie Steel Company at Bessemer and 8050 tons at South Chicago. The Cambria Steel Company gets 7500 and the Bethlehem Steel Company 2500 tons. The rails are to be 90 and 100 lbs. to the yard, except 1100 tons, which are of lighter sections. Three or four other large inquiries for rails are reported in the market, including one from the Harriman system for 40,000 tons. In the past week the Carnegie Steel Company sold about 2500 tons of light rails on new orders and received specifications for upward of 1000 tons. Prices on light rails are as follows: 12-lb. rails, 1.25c.; 16, 20 and 25-lb., 1.21c. to 1.25c.; 30 and 35-lb., 1.20c., and 40 and 45-lb., 1.16c. The prices are f.o.b. at mill, plus freight, and are the minimum of the market on carload lots, small lots being sold at a little higher price. Standard sections are held at 1.25c. per pound.

Structural Material.—Bids have gone in on about 36,000 tons of material for the Hell Gate bridge of the Pennsylvania Railroad, the bidders being the American Bridge Company and the McClintic-Marshall Construction Company. The American Bridge Company has taken 4000 tons for the Hotel Statler, Cleveland. Reports are that very low prices continue to be made on new contracts, and it is insisted that in some cases the plain material must certainly have been figured on a lesser basis than 1.35c., Pittsburgh. We quote beams and channels up to 15 in. at 1.35c., Pittsburgh.

Plates.—Some car orders have been placed the past week and others are expected to be given out in the near future. The Canadian Pacific has placed orders for 400 steel underframe box cars and 500 steel gondolas with the Pressed Steel Car Company and also 500 steel gondolas with the American Car & Foundry Company. The Pennsylvania Railroad has placed an order with the Pressed Steel Car Company for 41 steel passenger cars, and an order for 20 steel baggage cars with the American Car & Foundry Company. The general demand for plates from boiler shops and other consumers continues quiet, the recent reduction of $1 a ton not having stimulated business to any extent. We quote tank plate ¼ in. and heavier at 1.35c., Pittsburgh.

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Sheets.—The lowering of prices on black and galvanized sheets has not improved the demand to any extent but the belief is that it will do so in the near future. Specifications against contracts are not very satisfacory. This week the American Sheet & Tin Plate Company is operating 53 per cent. of its sheet mill capacity and the independent sheet mills are running at about the same rate. The new prices in effect from June 1, on black and galvanized sheets, and also on roofing sheets, are given on a previous page.

Tin Plate.—This week the American Sheet & Tin Plate Company is operating 63 per cent. of its hot tin mill capacity and the outside tin plate mills are running at about the same rate. New demand for tin plate is dull, as always at this season of the year, but specifications from the can makers have been coming in quite freely for some time, and between June 15 and July 1 the specifications for September requirements are expected to be quite heavy. We quote 100-lb. coke plates at $3.70 per base box f.o.b. Pittsburgh.

Bars.—The recent reduction in prices of steel bars has brought out some new demand. The large makers of steel bars, such as the Carnegie Steel Company, Jones & Laughlin Steel Company and Republic Iron & Steel Company, reporting that they have taken considerable new tonnage the past week from the implement trade for shipment over the year beginning July 1. Today (June 6) a conference opens at Cambridge Springs, Pa., between the Western Bar Iron Association and the Amalgamated Association, at which the puddling and finishing scales will come up for settlement. It is believed these scales will be settled this year without serious trouble, but several conferences may be necessary before an agreement is reached. New demand for iron bars is quiet and prices are weak. We quote steel bars at 1.25c. and common iron bars at 1.25c. to 1.30c., f.o.b. Pittsburgh.

Shafting.—New demand continues quiet and is still confined to small lots to cover actual needs, while specifications against contracts are unsatisfactory and have been for some time. Regular discounts on cold rolled steel shafting are 57 per cent. off in carloads and 52 per cent. in less than carloads delivered in base territory, but these prices are being shaded on desirable orders.

Spelter.—A sale of 500 tons of prime grades of Western spelter for October shipment is reported on the basis of about 5.17½c., East St. Louis, equal to 5.30c., Pittsburgh. We quote prime grades at this price.

Hoops and Bands.—New orders continue light and specifications against contracts are unsatisfactory. Hoop prices are continued on the basis of 1.45c., but band prices have been reduced to 1.25c., base, to conform to the new steel bar price, taking extras as per steel bar card.

Merchant Steel.—Conditions in this trade are quiet, the new demand being light and only for small lots, while specifications against contracts have been very unsatisfactory to the mills for some time. Nominal prices, which, however, are being shaded, are as follows: Iron finished tire, ½ x 1½ in. and heavier, 1.40c., base; under these sizes, 1.55c.; planished tire, 1.60c.; channel tire, 1.80c., base; toe calk, 1.90c.; flat sleigh shoe, 1.55c.; concave or convex, 1.75c.; cutter shoes, tapered or bent, 2.25c.; spring steel, 2c.; machinery steel, smooth finish, 1.90c.

Rivets.—There is a fair amount of inquiry, but the consumers are very slow in placing orders because of the reductions in prices on other forms of finished iron and steel, believing that still lower prices on both structural and boiler rivets may result. We quote structural rivets at 1.75c. and boiler rivets at 1.80c. to 1.85c., f.o.b. Pittsburgh.

Wire Products.—The new demand for wire and wire nails both from jobbers and retailers is still confined to small lots to cover actual needs, while specifications against contracts are being held up. New trade in wire products is practically over until fall business opens up. We quote galvanized barb wire at $2.10; painted, $1.80; annealed fence wire, $1.60; galvanized, $1.90; wire nails, $1.80, and cut nails, $1.60, f.o.b. Pittsburgh, full freight to destination added.

Spikes.—No large inquiries are in the market, the demand being confined to small lots to cover actual needs. The railroads are not specifying very freely on contracts placed some time ago. We quote railroad spikes in standard sizes at $1.50 base, Pittsburgh, with the usual extras for odd sizes.

Merchant Pipe.—The only inquiry of note for line pipe is one for a West Virginia gas company for 30 miles of 12-in. which may possibly be placed this week. A readjustment has been made in prices on oil country goods to conform to the change in prices on merchant pipe made on October 1, 1910, slight reductions being made on some sizes. Some new business in merchant pipe is being placed with the mills, but jobbers and retailers are still inclined to take in only such quantities as are absolutely required to meet current needs. It is stated that discounts on iron and steel pipe printed on a previous page are being maintained.

Boiler Tubes.—There is no improvement in the demand for boiler tubes, consumers not covered by contracts placing only small orders to care for actual needs, while specifications against contracts are only fair. Prices on both iron and steel boiler tubes continue very unsatisfactory and are more or less shaded.

Coke.—There are no large inquiries in the market for furnace coke, but the American Locomotive Company has an inquiry out for its entire supply of foundry coke for the year beginning July 1, which will amount to 18,000 to 20,000 tons if the concern operates its works full time. The American Steel Foundries is also in the market for 10,000 to 12,000 tons of foundry coke for shipment over the last half of the year. We quote standard makes of furnace coke for June shipment at $1.45 to $1.50 per net ton at oven, and for delivery over second half of the year at $1.70 to $1.75 at oven. We quote standard makes of 72-hour foundry coke for spot shipment at $1.75 to $1.85, and for second half of the year at $2 to $2.40 per net ton at oven, some producers refusing to sell at a lower price than $2.40. The output of coke in the upper and lower Connellsville regions is steadily decreasing, the output for last week having been about 270,000 tons, a decrease over the previous week of about 5000 tons, and the lowest output of any one month for several years.

Iron and Steel Scrap.—On July 1 a number of important consumers of scrap will close down their plants for inventory and repairs, and will therefore take in as little as possible this month. The Pennsylvania Railroad list came out on Monday with upward of 20,000 tons. The list is heavier than usual, owing to the fact that a good deal of the scrap offered in the May list was not sold because of the low prices offered by dealers. The heavy steel scrap of the Pennsylvania Lines West was sold to a local dealer last week at the reported price of about $13 at various points on the line. Prices on heavy steel scrap seem to be firm, in spite of the fact that buying is very light. There have been no important sales during the week. Dealers are quoting, per gross ton, Pittsburgh, about as follows:

Heavy steel scrap, Steubenville, Follansbee, Sharon, Monessen and Pittsburgh delivery	$13.0
No. 1 foundry cast	$13.50 to 13.75
No. 2 foundry cast	12.50 to 12.75
Bundled sheet scrap, at point of shipment	10.25 to 10.50
Rerolling rails, Newark and Cambridge, Ohio, and Cumberland, Md.	13.50 to 13.75
No. 1 railroad malleable stock	12.00
Grate bars	10.50 to 10.75
Low phosphorus melting stock	16.50 to 16.75
Iron car axles	24.25 to 24.50
Steel car axles	18.50 to 18.75
Locomotive axles	23.00
No. 1 busheling scrap	12.00 to 12.25
No. 2 busheling scrap	8.50 to 8.75
Old car wheels	13.50 to 13.75
Sheet bar crop ends	15.50 to 15.75
*Cast iron borings	8.75 to 9.00
*Machine shop turnings	9.15 to 9.25
Old iron rails	15.00 to 15.25
No. 1 wrought scrap	14.25 to 14.50
Heavy steel axle turnings	10.25
Stove plate	10.50 to 10.75

*These prices are f.o.b. cars at consumers' mill in the Pittsburgh district.

Cincinnati

CINCINNATI, OHIO, June 7, 1911.—*(By Telegraph.)*

Pig Iron.—The settling of prices has brought out a few more inquiries and orders, but the present interest taken in the market is considered largely of a speculative nature. For last-half shipment a central Ohio consumer wants 1000 tons of foundry iron about equally divided between Northern and Southern brands. A central Indiana melter is inquiring for 500 tons of No. 2, Southern, and a nearby manufacturer is in the market for 400 tons of Northern foundry. From Detroit is an inquiry for 500 tons of low phosphorus iron for prompt shipment. Sales include about 3500 tons of No. 2 Southern foundry to Northwestern melters at $10.50, Birmingham, July-December delivery. Several smaller lots were also booked for this same

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shipment and price. Quotations of the lower grades are evidently seeking the usual level and for the third quarter a local agency took on 500 tons of No. 4 Southern foundry on the basis of $10.50 at furnace for No. 2 Northern. No. 2 foundry is fairly settled at $13.50, Ironton, and a number of small sales have been made on this basis for delivery throughout the year. Northern furnaces, however, are generally unwilling to contract for any large tonnages at this quotation, and several are making preparations to shut down. Malleable is very quiet and quotable around $13.75 at furnace for this year's delivery. Belfont furnace, Ironton, damaged by storm June 4, closed for repairs, and will probably stay out indefinitely. Norton furnace, Ashland, which has been out two weeks, will blow in again about July 1. Marting Iron & Steel Company's furnace, Ironton, will bank for relining this week. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft	$14.25 to $14.75
Southern coke, No. 2 foundry and 2 soft	13.75 to 14.25
Southern coke, No. 3 foundry	13.50 to 13.75
Southern coke, No. 4 foundry	13.00 to 13.25
Southern gray forge	12.50 to 13.00
Ohio silvery, 8 per cent. silicon	17.45 to 17.70
Lake Superior coke, No. 1	15.45
Lake Superior coke, No. 2	14.95
Lake Superior coke, No. 3	14.45
Basic Northern	15.20 to 15.45
Standard Southern car wheel	25.75 to 26.25
Lake Superior car wheel	19.50

(By Mail)

Coke.—Quite a number of foundry coke contracts that are expiring have been renewed for a supply to be furnished during the remainder of the year and a still larger percentage of foundrymen are taking advantage of the present prices to contract for an entire 12 months' requirements. It is noticeable, however, that quantities usually specified are generally reduced, and consumers are further fortifying themselves against being compelled to specify against their contracts during the next two or three months. Prices on 72-hr. foundry coke range all the way from $2 to $2.40 per net ton, at oven, in all three fields, and it is understood that a few brands are available for last half delivery around the first-named figure. Furnace coke is very quiet, and while there are two small inquiries out, totaling about 10,000 tons, for shipment the next six months, these are offset by many requests to discontinue shipments on contracts already made. Prices remain around $1.40 to $1.45 per net ton, at oven, for spot shipment coke and from $1.45 to $1.70 on future contract business.

Finished Material.—The reduction in the price of steel bars is reported to have brought out a little more business in that particular line, but the lowering of quotations of other finished steel products appears to have stifled mill orders. Local warehouses report an indifferent attitude on the part of buyers, who are only filling for immediate requirements. The warehouse price on steel bars has been reduced from 1.80c. to 1.70c. and on No. 10 blue annealed sheets from 2.10c. to 2c., with corresponding reductions on other gauges. Railroad track material shows a little improvement. Hoops and bands are also holding up remarkably well, if present conditions are taken into consideration.

Old Material.—It is difficult to give the exact market situation. The majority of dealers are waiting to see what pig iron will do, and sellers of scrap material are using the same tactics. The small lots changing hands now are conceded to be at prices below the regular quotations, but the volume of business transacted is too small on which to base any change in present figures. Prices for delivery in buyers' yards, southern Ohio and Cincinnati, are as follows:

No. 1 railroad wrought, net ton	$11.50 to $12.00
Cast borings, net ton	4.50 to 5.00
Steel turnings, net ton	5.50 to 6.00
No. 1 cast scrap, net ton	9.75 to 10.00
Burnt scrap, net ton	7.00 to 7.50
Old iron axles, net ton	16.50 to 17.00
Bundled sheet scrap, gross ton	7.25 to 8.25
Old iron rails, gross ton	13.50 to 14.00
Relaying rails, 50 lb. and up, gross ton	21.00 to 22.00
Old car wheels, gross ton	10.75 to 11.75
Heavy melting steel scrap, gross ton	10.00 to 10.50

Chicago

FISHER BUILDING, June 7, 1911.—*(By Telegraph.)*

It is to be presumed that the failure of buying interests, particularly users of bars, to respond to the reductions in prices comes as a surprise and a disappointment. It is hardly to be believed that lower prices were put into effect with no particular object in view. It is generally accepted here that only a small tonnage of steel bars has been placed under contract for this season. There seems to be but one objection, namely, that the now current price, in view of the general situation, does not furnish an occasion upon which bar users feel secure in basing their year's campaign in other lines of finished steel products. The effect of the reductions seems to have been far from conclusive, and the character of buying for immediate requirements only remains unchanged.

Pig Iron.—Transactions of the past week were limited to requirements for immediate use. Those melters who have been or are buying iron because they consider it low in price still have this iron in their yards. The price of Southern iron continues to be quoted at $10.50 Birmingham, for No. 2 and $15 f.o.b. furnace is quoted for local Northern iron. It appears probable that the Southern price is more easily assailable than that of Northern iron, and the opinion is expressed that an attractive offer of tonnage would not go begging at somewhat lower prices than the prevailing quotations. It is estimated that the entire business placed during the past week in this territory would not exceed 10,000 tons. The continuation of the present dullness is not unlikely to result in a further curtailment of production by some of the local furnaces. The following quotations are for Chicago delivery, with the exception of Northern irons, which are now quoted f.o.b. furnace:

Lake Superior charcoal	$17.00
Northern coke foundry, No. 1	15.50
Northern coke foundry, No. 2	15.00
Northern coke foundry, No. 3	14.75
Northern Scotch, No. 1	16.00
Southern coke, No. 1 foundry and No. 1 soft	15.35
Southern coke, No. 2 foundry and No. 2 soft	14.85
Southern coke, No. 3	14.60
Southern coke, No. 4	14.35
Southern gray forge	14.60
Southern mottled	14.60
Malleable Bessemer	15.00
Standard Bessemer	17.40
Basic	15.50
Jackson Co. and Kentucky silvery 6%	17.90
Jackson Co. and Kentucky silvery, 8%	18.90
Jackson Co. and Kentucky silvery, 10%	19.90

(By Mail.)

Structural Material.—The principal letting of the week in structural material was the placing of 5932 tons for the Otis Bank Building at LaSalle and Madison streets, in this city, with the American Bridge Company. This interest also closed a contract for 665 tons of material for ore dock spouts for an extension of No. 1 dock of the Duluth & Iron Range Railroad at Two Harbors, Minn. The steel for the Tribune Building, Terre Haute, Ind., 380 tons, will be furnished by the Decatur Bridge Company. The Otis Building tonnage brings up the total of structural steel for Chicago buildings now in process of erection to approximately 60,000 tons, and the future building now in prospect promises further tonnage of almost equal amount. Belief is expressed that the point of lowest prices for fabricated material is past for this market and it is predicted that the present level, which is in the neighborhood of $40 a ton, will rise to about $44. The probabilities in this connection appear to depend somewhat on the class of work, it being likely that the lowest prices will be made on light work which will bring into competition the smaller shops and upon the heavy work which is particularly desirable tonnage. We quote plain material from mill at 1.53c. to 1.58c., Chicago; from store, 1.75c.

Rails and Track Supplies.—In a scattering way the specifications and orders from the railroads the past week have been well maintained. The largest interest reports an aggregate of standard section rails ordered in the neighborhood of 10,000 tons, accompanied by moderate requirements of spikes, bolts and tie plates. There are those who believe they see in financial arrangements and general attitude a disposition on the part of some of the railroads to prepare for larger buying. This may be in anticipation of the closing of the fiscal year July 1. We quote standard railroad spikes at 1.65c. to 1.75c., base; track bolts with square nuts, 2.15c. to 2.25c., base, all in carload lots, Chicago. Standard section Bessemer rails, 1.28c.; open hearth, 1.34c.; light rails, 40 to 45 lb., 1.16c. to 1.20½c.; 30 to 35 lb., 1.19½c. to 1.24c.; 16, 20 and 25 lb., 1.20½c. to 1.25c.; 12 lb., 1.25c. to 1.30½c., Chicago.

Sheets.—To the sheet mill capacity of the West the new mill of the American Sheet & Tin Plate Company at Gary was added during the past week. It will shortly be in a position to furnish both black and galvanized sheets. The Western market has as yet failed to respond to the reduction in sheet prices. If anything, less

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activity has prevailed. From the standpoint of the producer the now existing prices are as low as the cost of making quality sheets will permit. The buyer carries with him the memory of reductions in the past and apparently is content to let necessity govern the volume of his purchases. Chicago prices are as follows: Carload lots, from mill: No. 28 black sheets, 2.18c.; No. 28 galvanized, 3.08c.; No. 10 blue annealed, 1.68c. Prices from store, Chicago, are: No. 10, 1.95c. to 2.05c.; No. 12, 2.00c. to 2.10c.; No. 28 black, 2.60c. to 2.70c.; No. 28 galvanized, 3.35c. to 3.45c.

Plates.—A livelier interest is reported in plates, but with the exception of certain inquiries for small tonnages buying is confined to immediate requirements. While sales at the new prices are nominally limited to October 1 it is believed that deliveries up to January 1 can be arranged on the same basis. There is no conspicuous evidence that buyers lack confidence in the stability of plate prices following a reduction of only $1 a ton, but at the same time the immediate desirability of purchasing on the present basis is not reflected in their attitude. The market apparently is not impressed with the new prices as an "opportunity." Chicago quotations for mill shipment are 1.53c. to 1.58c. and from store 1.75c.

Bars.—Developments subsequent to the reduction in the price of bars seem to indicate that there was no large volume of business arranged for closing at the new basis. The tonnage that has been placed thus far is considerably less than that usually on the order books at this time. The manufacturing schedules of most of the agricultural implement manufacturers are reported to be considerably below normal, and until the prospect for business during the coming year becomes more clearly defined these interests appear to be content to move slowly. We quote as follows, f.o.b. Chicago: Soft steel bars, 1.43c.; bar iron, 1.20c. to 1.25c.; hard steel bars, rolled from old rails, 1.20c. to 1.25c. From store, soft steel bars, 1.70c. to 1.80c., Chicago.

Billets.—The movement of billets in this territory normally is limited to comparatively few forging interests, and in the current lack of business is the more restricted. Forging billets are nominally quoted at $28.60, Chicago, and such sales as are reported indicate adherence to this price. Rerolling billets we quote at $23.60, Chicago.

Wire Products.—Sustained by a continued demand for woven wire fence the trade in wire products is holding up in what is ordinarily a dull season in good volume. Diminished activity in building operations has been followed by some dullness in wire nails. The movement of barb wire is also quiet. Stocks in the hands of merchants are small, but it is not admitted that this may indicate a lack of confidence in the stability of present prices, which remain unchanged. Jobbers' carload prices, which are quoted to manufacturing buyers, are as follows: Plain wire No. 9 and coarser, base, 1.78c.; wire nails, 1.98c.; painted barb wire, 1.98c.; galvanized, 2.28c.; polished staples, 1.98c.; galvanized, 2.28c., all Chicago.

Cast Iron Pipe.—In contrast with the general dullness the leading cast iron pipe interest continues exceedingly busy, with tonnages secured early in the year from Milwaukee, Chicago, Mineapolis and Portland, Ore. The requirements of San Diego, Cal., to the amount of 7500 tons in sizes from 8 to 36 in., will probably be formally placed with the United States Cast Iron Pipe & Foundry Company, which is the low bidder. The 600 tons of pipe at Mandan, N. D., has not been placed, all bids being rejected. Contracts for 250 to 300 tons of pipe for Leone, Iowa, and 500 tons for Basin, Wyo., are to be placed this week. The well filled condition of the shops of the leading interest is conducive to firmness in prices, but not to the extent of requiring advances in quotations. We continue to quote as follows, per net ton, Chicago: Water pipe, 4 in., $25.50; 6 to 12 in., $24.50; 16 in. and up, $24, with $1 extra for gas pipe.

Old Material.—The only transactions of interest in the old material market are those involving the sale of scrap by the railroads, and dealers are fairly active in absorbing this material. The Chicago, Rock Island & Pacific Railroad is selling a small list, of which the principal item is 500 tons of No. 1 steel rails, together with a small quantity of iron axles and No. 1 cast. The St. Louis & San Francisco is offering two scrap locomotives. A list of about 200 tons from the Baltimore & Ohio will be closed June 8. The Lake Shore & Michigan Southern is asking for bids on about 33 cars of mixed material. At present levels yard sales are impossible without loss to the dealer. At the same time manufacturers converting scrap into finished products feel that old material prices are still relatively too high. We revise prices and quote below for delivery to buyers' works, all freight and transfer charges paid, per gross ton:

Old iron rails	$14.00 to $14.50
Old steel rails, rerolling	12.00 to 12.25
Old steel rails, less than 3 ft	11.00 to 11.50
Relaying rails, standard sections, subject to inspection	23.00 to 24.00
Old car wheels	12.50 to 13.00
Heavy melting steel scrap	10.25 to 10.75
Frogs, switches and guards, cut apart	10.25 to 10.75
Shoveling steel	9.25 to 10.25
Steel axle turnings	8.50 to 9.00
The following quotations are per net ton:	
Iron angles and splice bars	$12.25 to $12.75
Iron arch bars and transoms	13.50 to 14.00
Steel angle bars	10.25 to 10.75
Iron car axles	18.00 to 18.50
Steel car axles	16.75 to 17.25
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	10.00 to 10.50
Steel knuckles and couplers	9.50 to 10.00
Locomotive tires, smooth	16.25 to 16.75
Machine shop turnings	6.25 to 6.75
Cast and mixed borings	5.25 to 5.75
No. 1 busheling	8.75 to 9.25
No. 2 busheling	6.75 to 7.25
No. 1 boilers, cut to sheets and rings	7.50 to 8.00
Boiler punchings	12.00 to 12.50
No. 1 cast scrap	10.50 to 11.00
Stove plate and light cast scrap	9.00 to 9.50
Railroad malleable	10.25 to 10.75
Agricultural malleable	9.25 to 9.75
Pipes and flues	8.00 to 8.50

Cleveland

CLEVELAND, OHIO, June 6, 1911.

Iron Ore.—Ore shipments in May were larger than had been expected in view of the condition of the market. The total movement during the month was 3,684,819 tons. Shipments down the lakes from the opening of navigation until June 1 were 4,016,464 tons, as compared with 7,601,665 tons during the same period in 1910. Last year, however, the early movement was very heavy. The ore market is lifeless, there being no sales or inquiries for lots of any size. Conditions in the lake trade have improved somewhat during the past few days as the result of the chartering of some wild tonnage by the Pittsburgh Steamship Company. Stock piles at some of the mines have become larger than desired and it is probable that operation of some properties will be further curtailed. The cut in steel prices is not expected to stimulate the demand for ore unless lower prices cause an improvement in the demand for steel. We quote prices as follows: Old Range Bessemer, $4.50; Mesaba Bessemer, $4.25; Old Range non-Bessemer, $3.70; Mesaba non-Bessemer, $3.50.

Pig Iron.—The sale of 5000 tons of basic has been made by a local agency for shipment from a Detroit furnace to Chicago. Outside of this transaction the market continues very dull. There is no inquiry in this territory for lots of any size in any grade. Some of the inquiries for small lots of foundry iron that have come out during the past few weeks have not resulted in the placing of orders. A large share of the foundries have bought no iron for the last half but in most cases these will have enough iron left over to last them a month or more into the last half. It is estimated that foundries are now running in this territory at about 60 per cent. of their full capacity. Prices on foundry grades are more or less nominal. Some producers now express their willingness to make contracts for delivery through the last half at the same price as for prompt shipment. Southern iron is now quite generally quoted at $10.50, Birmingham, for No. 2 for delivery through the entire year. For prompt shipment and the last half we quote delivered, Cleveland, as follows:

Bessemer	$15.90
Basic	14.00
Northern foundry, No. 2	14.25
Gray forge	13.50
Southern foundry, No. 2	$14.85 to 15.35
Jackson Co. silvery, 8% silicon	$17.75 to 18.00

Coke.—The market is extremely dull. A few contracts for foundry grades are being closed and there is a small volume of spot business. We quote standard Connellsville furnace coke at $1.45 to $1.55 per net ton, at oven, for prompt shipment, and $1.75 to $1.80 for the last half. Connellsville 72-hr. foundry coke is held at $1.90 to $2 for prompt shipment and $2 to $2.40 for the last half.

Finished Iron and Steel.—No increase in the demand for finished lines has as yet resulted from the

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cut in prices. The market is in a very unsettled state. Buyers feel that further reductions in prices will come shortly and are ordering only such material as they need immediately. The new price of 1.25c., Pittsburgh, on steel bars has already been shaded $1 a ton in this market, but this concession as yet does not appear to be very general. Considerable excitement was aroused among the trade during the week by the action of one selling agency in making a one-day quotation on steel bars to consumers at 1.20c. for delivery during the remainder of the year, this price being offered for acceptance only during the one day. This price has resulted in the demand by some of the buyers who had quite recently placed contracts on the 1.25c. basis that their contracts be readjusted to the new price for the remainder of the year. There is an inquiry out for 1700 tons of soft steel reinforcing bars for a plant to be built by the Larkin Company in Buffalo. Another bar inquiry is for 400 tons from the Great Lakes Dredge & Dock Company for delivery after October 1. Makers of hard steel bars are not yet making general price quotations, but are waiting until prices on soft steel bars become more settled. Prices on hard steel, however, will be reduced to about $2 a ton below soft steel. Structural material appears firm at 1.35c., Pittsburgh, but work requiring tonnage of any size is being held up until buyers become satisfied that the bottom has been reached. The demand for plates is very light and there are no reports yet of price shading. The Great Lakes Engineering Works, Detroit, has taken the contract for two ocean steamers for the Atlantic coast trade, each 261 ft. long. The plates and shapes will be furnished by the Cambria Steel Company. The large cut in sheet prices has stimulated the demand somewhat, buyers feeling that prices will go no lower. The reduction in steel bars has been followed by a reduction of $1 to $2 a ton on rivets. Structural rivets are now quoted at 1.65c., Pittsburgh, and boiler rivets 1.75c. The demand for iron bars is light. The general quotation is 1.25c. at mill. The Union Rolling Mill Company and the Empire Rolling Mill Company, Cleveland, will close down their plants July 1 for an indefinite period.

Old Material.—The scrap market is extremely dull. Prices are nominally unchanged. Although the market is weak there has not been enough business since the cut in steel prices to warrant any change in the quotations made before the reduction in finished lines. Local consumers are offering $11 for heavy steel scrap, but $11.50 appears to be the minimum price that will be accepted by dealers. Some consumers are holding back on shipments on contract. The local bar iron mills will close down shortly and this will further curtail the demand. The Pennsylvania Railroad has a large list out, on which it will receive bids June 13. The Lake Shore Railroad will close this week on a small list. Dealers' prices per gross ton, f.o.b. Cleveland, are as follows:

Old steel rails, rerolling	$13.00 to $13.50
Old iron rails	15.00 to 15.50
Steel car axles	17.50 to 18.00
Heavy melting steel	11.00 to 11.50
Old car wheels	11.50 to 12.00
Relaying rails, 50 lb. and over	22.50 to 23.50
Agricultural malleable	10.75 to 11.00
Railroad malleable	11.50 to 12.00
Light bundled sheet scrap	7.50 to 8.00

The following prices are per net ton, f.o.b. Cleveland:

Iron car axles	$21.00 to $21.50
Cast borings	6.00 to 6.25
Iron and steel turnings and drillings	6.50 to 6.75
Steel axle turnings	8.00 to 8.50
No. 1 busheling	9.50 to 10.00
No. 1 railroad wrought	11.50 to 12.00
No. 1 cast	11.25 to 11.50
Stove plate	10.25 to 10 50
Bundled tin scrap	11.00 to 11.50

St. Louis

ST. LOUIS, MO., June 5, 1911.

The market continues quiet in all branches, though there is a steady consumption under way that is at least gratifying in its evidence that there is no occasion to look for any marked decrease in prices. There is a feeling that the next two or three weeks will see an improvement; hence with the dullness there is no discouragement apparent.

Pig Iron.—The consumption of pig iron continues quite regular, and, though the large users are not running to capacity, the agricultural, stove foundry and other consumers are utilizing a good quantity. From this viewpoint there is really a better demand than there has been in recent weeks, and, while sellers are largely influenced by bear talk, there is, as a matter of fact, a very fair total of business moving, all things considered. One purchase for the week aggregated 2500 tons of different grades of Southern, while another smaller consumer took 500 tons of basic for steel foundry use. The market for pig iron continues to cling around $10.50 to $11 for No. 2, Birmingham, the former figures not being altogether unanimously held by the furnacemen. There has been nothing in the requisitions to show an immediate probability of a firmer or higher market, but there is a feeling that it is not far off. There has been no change in No. 2 Northern foundry iron, which continues at $14 to $14.50, either for shipment to July or last half, Ironton, Ohio, basis. The same figures apply for malleable Bessemer. As indicative of the general requisition for pig iron by other than the larger consumers may be quoted the statement of the largest agricultural implement factory here, that May's business was the largest in many years for the same period. Buyers, however, still show little active interest, only being concerned with current needs.

Coke.—There is a greater activity in the inquiry for foundry coke, but the consumption remains about unchanged. The inquiry is largely for last-half delivery, and some for delivery to July 1, 1912. The quotations are: $2 to $2.50 per net ton at oven for 72-hour selected foundry, Connellsville or Stonega. No contracts have been made as yet of any size, nor is it expected that there will be until later in the month.

Finished Iron and Steel.—The tonnage in structural steel continues very light, due to the still unsettled condition of the market as a whole Indications lead, however, to the belief that there will be orders placed for a considerable tonnage within the next ten days or two weeks, the price holding firm on the new basis of 1.35c., Pittsburgh. A number of contractors have considerable work nearing the stage when they must have the steel, and they will not be able to remain out of the market much longer. Plates are dull, with no change in prices. In bars there have been increased specifications, but the difference in favor of iron at the present moment has been sufficiently attractive to warrant considerable tonnage being ordered instead of steel. The demand from the agricultural plants is fairly active. In rails the Kansas City Southern contracted for 14,000 tons, dividing the order between the Illinois Steel Company and the Pennsylvania Steel Company. A smaller line placed an order for 750 tons with the Illinois Steel Company, and still another, in Oklahoma, for 500 tons. The additional tonnage of the Missouri Pacific, to follow the order for 25,000 tons given the Colorado Fuel & Irbn Company, has not been placed yet. In light rails the demand of the coal mining companies has slackened somewhat, but a number of lumber firms have contracted for a very nice tonnage during the week. Track fastenings are in fair demand, and the prices are firm.

Old Material.—Scrap continues dull, and nothing is expected to develop of particular interest in the near future. The speculative disposition continues, and consumers are making their propositions too low to enable the closing of any deals of consequence. There is, perhaps, a little weaker feeling in the market, but it has not affected prices as yet. The 'Frisco list shows a total of about 1600 tons. There is a little better demand for steel, largely because the dealers are short, but the difference is so slight as yet as to make no change in the figures. The dealers' prices, per gross ton f.o.b. St. Louis, are as follows:

Old iron rails	$12.50 to $13.00
Old steel rails, rerolling	11.25 to 11.75
Old steel rails, less than 3 ft.	10.25 to 10.75
Relaying rails, standard section, subject to inspection	23.00 to 23.50
Old car wheels	12.00 to 12.50
Heavy melting steel scrap	10.25 to 10.75
Frogs, switches and guards cut apart	10.25 to 10.75

The following quotations are per net ton:

Iron fish plates	$10.25 to $10.75
Iron car axles	17.50 to 18.00
Steel car axles	17.00 to 17.50
No. 1 railroad wrought	10.25 to 10.75
No. 2 railroad wrought	9.25 to 9.75
Railway springs	9.00 to 9.50
Locomotive tires, smooth	15.50 to 16.00
No. 1 dealers' forge	8.50 to 9.00
Mixed borings	4.50 to 5.00
No. 1 busheling	8.50 to 9.00
No. 1 boilers, cut to sheets and rings	7.25 to 7.75
No. 1 cast scrap	9.50 to 10.00
Stove plate and light cast scrap	8.00 to 8.50
Railroad malleable	8.00 to 8.50
Agricultural malleable	7.00 to 7.50
Pipes and flues	7.25 to 7.75
Railroad sheet and tank scrap	7.25 to 7.75
Railroad grate bars	7.50 to 8.00
Machine shop turnings	6.00 to 6.50

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Buffalo

BUFFALO, N. Y., June 6, 1911.

Pig Iron.—Very little new business has been in evidence during the current week, active negotiations having been checked by the unsettled price conditions in finished products. Most consumers are manifesting no special interest in the market, although a large number of important users have not yet covered for their second half requirements, apparently planning in some instances to run for awhile on stock left over from the first half. Quite a number of inquiries received during the past two weeks are still held open and a large majority of buyers appear to be waiting to determine whether rock bottom has been reached in prices. One or two fair-sized orders for malleable have been placed; but foundry grade placements for the week have consisted almost entirely of small tonnages. We make no change in the price schedule from last week as it closely approximates the present price situation. The variation in price between grades is more theoretical than actual. Each order of any size is handled on its own merits, regardless of grade classification. For current and third quarter delivery we quote as follows, f.o.b. Buffalo:

No. 1 X foundry	$14.00 to $14.50
No. 2 X foundry	13.75 to 14.00
No. 2 plain	13.50 to 13.75
No. 3 foundry	13.25 to 13.50
Gray forge	13.00 to 13.25
Malleable	13.75 to 14.25
Basic	14.00 to 14.75
Charcoal	16.50 to 17.25

Finished Iron and Steel.—The lower prices established for finished products have caused good inquiry especially on sheets and bars, with some bar tonnage placed and considerable tonnages still pending. Sheet users seem to appreciate that the lower prices quoted on sheets represent the bottom and are inclined to negotiate for their third and fourth quarter deliveries. So far as can be determined $1.25 represents the market on bars; although one consumer who was in the market for a large tonnage for prompt specification claims to have bought at a somewhat better price. Plates and shapes are held at 1.35c. but placement for the week has been small. Prices on wire products are being maintained at 1.80c. Pittsburgh; and cold rolled material is held at 60 off for carloads and 55 off for less than carloads. An order is now pending for about 1500 tons of steel bars for concrete reinforcement and an equivalent quantity of girders and plates for the 10-story warehouse to be erected by the Larkin Company, soap makers, this city.

The Buffalo Structural Steel Company has been awarded the contract for 375 tons of structural material for the third building of the extensive lithographing plant now under construction for the Huebner-Bleistein Patents Company, Buffalo. The Buffalo Structural Steel Company has also taken the contract for the structural steel for the Isaac Rosenbloom building, Syracuse, comprising 175 tons. The American Bridge Company has closed a contract with the Eastman Kodak Company, Rochester, for the fabrication and erection of steel for its factory building No. 43, requiring about 300 tons. Bids on revised plans for the Hutchinson High School, Buffalo, will be received next week; also bids for the remodeling of the Broadway Arsenal to a City convention hall and exposition building, Buffalo, requiring considerable steel.

Old Material.—The market is practically at a standstill, with very little material changing hands; consumers holding back awaiting the developments which may result from the recent cut in prices of finished materials. Dealers are taking no apparent interest in the market, there being no incentive for them to increase their stocks under the existing status. We quote as follows per gross ton f.o.b. Buffalo, the prices shown being almost entirely nominal:

Heavy melting steel	$11.50 to $12.00
Low phosphorus steel	14.00 to 14.50
No. 1 railroad wrought	13.25 to 13.50
No. 1 railroad and machinery cast scrap	12.75 to 13.25
Old steel axles	18.00 to 18.50
Old iron axles	22.00 to 22.50
Old car wheels	12.50 to 13.00
Railroad malleable	11.00 to 11.50
Boiler plate	9.50 to 10.00
Locomotive grate bars	10.00 to 10.25
Pipe	9.60 to 9.25
Wrought iron and soft steel turnings	6.25 to 6.75
Clean cast forgings	6.00 to 6.25

The German Iron Market

BERLIN, May 25, 1911.—Little news, and none that is good—that is about a summing up of the information from the iron trade this week. The situation, however, is evidently growing less satisfactory. Prices are giving way, where not rigidly controlled by trade combinations. This week the Steel Works Union has voted to begin taking foreign orders in structural shapes for the September quarter at unchanged prices; and the Wire-Rod Association yesterday declared general business open for the same quarter without change in prices.

The least satisfactory section of the trade remains the bar market. The Bourse has this week been depressed by a pessimistic report on this specialty, which represents prices as steadily falling, with consumers still holding back in expectation of even lower prices. it is further represented that the amount of work on hand with the various mills is dwindling rapidly. They are compelled to use some pressure to induce customers to send in their specifications on material already ordered; and in such cases still further concessions on prices are often made. It is now possible to buy basic steel cars at 98 to 100 marks for home delivery; while export orders are taken at from 92 to 95 marks, as against 95 to 97.50 a month ago.

Export Trade Continues to Suffer

The export trade continues to suffer from sharp Belgian competition. Mills beyond the western frontier are very short on orders and are compelled to make big concessions in prices to get foreign business; and the German mills are obliged to follow suit. In this state of the trade foreign buyers are in no hurry to place orders, whether in Germany or Belgium, since they see that they are masters of the situation, with prices moving in their favor.

It may be remarked here, too, that the general market situation in Belgium continues to weaken. This week the news from there is considerably worse than hitherto. All forms of steel material for further manufacture have again fallen 2 to 3s. a ton for export. Billets, free on board at Antwerp, now command 76 to 80s.; muck bars 77 to 79s; while heavy plates of basic steel have fallen about 1s., to 112—113s.

The Steel Works Union Report

Yesterday the Steel Works Union gave out its regular monthly review of the trade situation. It is very brief and rather less cheerful than previous reports. Home business in semi-manufactured materials, it is said, remains satisfactory both in the amount of orders on the books and in the arrival of specifications on order. The foreign market for such steel continues to grow quieter, and the union surmises that this is due chiefly to the situation in the United States. Foreign orders for heavy steel rails continue to come in as previously, and some of these are for large quantities; but the Imperial railroads—those, namely, of Alsace-Lorraine—have ordered 40 per cent. less even than the reduced amounts taken last year. Grooved rails continue in good demand from both home and foreign buyers, and this is also the case with rails for mines, though prices are depressed under foreign competition. The revival of business in structural shapes is maintained. Calls for delivery of this class of steel on foreign orders are satisfactory. New business is harder to get in England, but, on the other hand, there is a pretty good demand for Scandinavian countries, Holland, Switzerland, the Balkan countries, and Japan.

Pig Iron Trade Slightly Better

It is reported that a slight improvement has come over the pig iron trade, due to the better prospects for the completion of a national organization of the trade, which causes consumers to show increased willingness to place contracts, as they look for somewhat higher prices under a general organization. Since the arrangement of terms with the Siegerland furnaces the Essen Syndicate appears not to have made further progress with its efforts to bring the Luxemburg-Lorraine producers to terms. Negotiations will be continued next week. Another complication has arisen for the syndicate, however, by the demand of the great Gutehoffnungs-Hutte for an increase of 50 per cent. in its allotments. It is feared that this may prove a serious obstacle in the way of completing the organization. There is even talk in the press to the

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effect that the concern in question will give notice of its withdrawal from the syndicate as a means to force through its claim; but it is not seriously believed that this result will follow. The Essen Syndicate has recently begun taking orders for 1912 delivery in certain sections of the home market where English iron was being offered at cheaper prices by dealers.

Birmingham

BIRMINGHAM, ALA., June 5, 1911.

Pig Iron.—The trading in this market the past week was very light, despite the low level of prices, and the volume of inquiry received was considerably smaller than for the week previous. The most significant transaction recorded involved a lot of 2000 tons of No. 2 foundry for shipment over the remainder of this year, which was sold at $10.50, Birmingham. A lot of 500 tons of No. 3 foundry for shipment within three months brought $10, Birmingham, and 300 tons of analysis iron for prompt shipment was sold at $11, Birmingham. Carload lots of high manganese iron have sold at from $11.50 to $12, but the aggregate of such sales was very small. There has been some demand for gray forge and mottled grades and the quotations submitted have covered a comparatively wide range. It is not believed, however, that forge can be had at a lower figure than $9.50, or at a differential of 50c. per ton on an $11, Birmingham, basis. A small lot of mottled is available at $9, or at a differential of 50c per ton. on the price for forge. As to whether or not a basis of $10.50, Birmingham, would be shaded for the higher grades when spot shipments were offered, a definite statement is not warranted. There is some disposition on the part of the best authorities to believe that $10.25, Birmingham, would be accepted for a round tonnage of No. 2 foundry and $9.75 per ton for No. 3, provided that immediate shipment could be made, but as the stock reports for June 1 are not yet available, such a belief cannot be strengthened by referring to the aggregate accumulation of those grades. It is understood that the reports when in hand will show a substantial increase in the aggregate accumulation in May, notwithstanding the fairly satisfactory rate of shipment during that month. The movement from furnace yards has been considerably reduced since June 1 as a result of the suspension of operations at large foundries, and from present indications, a further curtailment of foundry operations will soon be made. The production of foundry iron in this State on June 1 was represented by 14 active stacks, with three additional stacks producing basic iron and two stacks on charcoal. We continue the quotations of last week, although the market is generally considered very weak without indications of an early improvement.

No. 1 foundry and No. 1 soft	$11.00
No. 2 foundry and No. 2 soft	10.50
No. 3 foundry	10.00
No. 4 foundry	9.75
Gray forge	9.50
Mottled	9.25
Standard basic, chill cast	10.50
"Off basic"	10.00
Charcoal carwheel iron	22.50

Cast Iron Pipe.—An aggregate of some 7000 tons of water pipe for requirement in the city of San Diego, Cal., was placed the past week, but the details of the transactions are not made public so far. Otherwise, the buying has been on a small scale and for maintenance work only. The rate of production continues below normal and in no case has stock accumulated to any appreciable extent. Several large contracts will be placed after satisfactory financial arrangements have been made, and the tonnage still on order books unshipped will take steady operation at all of the large plants. Water pipe quotations are considered nominal, but we continue to quote as follows, per net ton, f.o.b. cars here, as follows: 4 to 6-in., $22.50; 8 to 12-in., $22; over 12-in., average $21, with $1 per ton extra for gas pipe.

Old Material.—Dealers are adding to their stocks whenever bargain lots are offered, and after the same method of buying the movement to consumers continues at a fair rate. The prices received in transactions effected the past week indicate that a general revision has been made, but in view of the unsteadiness in the pig iron market the revised prices are quoted only nominally. We revise dealers' asking prices and quote as follows, per gross ton, f.o.b. cars here:

Old iron axles (light)	$13.50 to $14.00
Old steel axles (light)	12.50 to 13.50
Old iron rails	12.50 to 13.00
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	9.50 to 10.00
No. 1 country wrought	7.50 to 8.00
No. 2 country wrought	7.00 to 7.50
No. 1 machinery	9.50 to 10.50
No. 1 steel	8.50 to 9.00
Tram car wheels	8.00 to 8.50
Standard car wheels	9.50 to 10.50
Light cast and stove plate	7.00 to 7.50

Philadelphia

PHILADELPHIA, PA., June 6, 1911.

While business drags in practically all grades of crude and finished materials the excitement attending recent reductions in prices is gradually becoming less pronounced. Considerable hesitancy is still shown, however, in the placing of any important new contracts, although in instances specifications based on the new prices have been somewhat larger. Pig iron buying has been less active, although some Eastern producers are willing to make concessions from recent quotations for foundry grades on desirable business. At the present price levels Southern iron is becoming more of a factor in this market. Further business in steel making grades is reported, particularly in low phosphorus iron, prices for which are slightly lower. The demand for finished materials is not very active, although specifications based on the new prices are in instances reported as coming out more freely. Consumers are awaiting developments and believe that the present concessions will not be sufficient to induce any marked increase in buying. The old material market shows no marked change.

Iron Ore.—Sales of several cargoes of Spanish low phosphorus ore to an Eastern furnace are reported. The general ore market, however, continues extremely dull. Reports are heard of some price readjustments on Spanish ores, but sellers find it difficult to meet buyers' ideas, owing to the upward tendency of ocean freights. Importations in the week ended June 3 included 12,318 tons of Swedish, 5000 tons of Spanish, 1900 tons of Newfoundland, 4850 tons of Cuban and 2500 tons of Mediterranean ore.

Pig Iron.—The buying movement which attended the reduction in prices of Virginia foundry grades has largely subsided. There is still some little Virginia iron being contracted for, but principally in small lots for prompt and third quarter delivery, at both $12.25 and $12.50, furnace. The leading producer states, however, that it is believed that the quantity it desired to sell at the present low prices will be reached within the next ten days, when it will withdraw from the market. Eastern Pennsylvania foundry grades have not been in very active demand, while some producers are willing to make some concession they are not disposed to meet the low level named by some of the Virginia makers. Others still stand flatly at the higher prices recently prevailing, but are practically out of the market. Southern foundry at the present minimum basis of $10.50, Birmingham, for No. 2 is becoming more of a factor in the Eastern markets, particularly where rail and water freights are available, and on lower grades prices in a number of cases are now below the comparative range for eastern Pennsylvania irons. Very little inquiry covering any large quantities of foundry iron have developed in this vicinity. The Baldwin Locomotive Works has been in the market for 1500 tons of foundry forge, while one of the Delaware River pipe makers has been inquiring for 4000 tons of low grade iron, against which Southern iron will no doubt be taken. The general run of smaller consumers are not coming into the market very freely, as they appear to be satisfied to await further developments, the business closed being largely confined to small prompt lots, standard brands of eastern Pennsylvania No. 2 X foundry being available at prices ranging from $15.25 to $15.50, delivered, in this vicinity. There is practically an entire absence of any demand for forge iron from the rolling mills, and while no basis has been fixed by recent transactions the market is nominally quoted at $14.50 to $14.75, delivered, at which prices some sellers would be willing to take on business. Low phosphorus iron has shown a somewhat better movement, sales aggregating a fair quantity have been recently made, while inquiry for several thousand tons for an Eastern consumer is pending. Prices show a slight recession and standard low phosphorus is now quotable at $20.50 to $20.75, while brands not quite up to standard analysis might be had at slightly lower figures. Inquiry for ba-

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sic iron for fourth quarter delivery has recently been before the trade and while no definite information is available it is believed that some business of this character has been put through. The following range of prices is named for standard brands, delivered in buyers' yards in this vicinity, shipment extending up to the end of the third quarter:

Eastern Pennsylvania No. 2 X foundry	$15.25 to $15.50
Eastern Pennsylvania No. 2 plain	15.00 to 15.25
Virginia foundry	15.05 to 15.50
Gray forge	14.50 to 14.75
Basic	14.50 to 15.00
Standard low phosphorus	20.50 to 20.75

Ferromanganese.—There is still an absence of any demand from consumers in this vicinity. Sellers report some inquiry from the West, but the demand generally drags. Quotations are to a large extent nominal, being named at $36.50, Baltimore.

Billets.—Reduced prices have not resulted as yet in any pronounced improvement in the demand. Specifications on old contracts are developing somewhat better. Mills in this district continue to operate irregularly, and, while buyers occasionally make inquiries for the purpose of testing the market, very little new business is being placed. Open hearth rolling billets are quoted at $23.40 and ordinary forging billets $28.40, delivered in this vicinity.

Plates.—A moderate volume of miscellaneous business continues to be placed. Inquiry shows a slight improvement, and while largely confined to small lots, an occasional one for a good quantity comes out. Of the latter class one for 4000 tons of plates for gas holders on the Pacific coast is to be noted, for which delivery prices remain at the old basis, not being affected, it is stated, by the recent reductions. Specifications on old contracts have been somewhat heavier since the first of the month, when the new basis of prices became effective, particularly for bridge and locomotive work. All makers in this district are quoting the new basis, 1.50c., delivery here, for ordinary heavy steel plates.

Structural Material.—The demand does not show any betterment. Several new propositions are in sight in this city, including a school building, which will require about 2500 tons, and a new branch Y. M. C. A. building. A number of small buildings are also being figured on, but develop slowly. Several fair-sized contracts for fabricated work in the New York district have been taken by producers in this territory, including one of 1200 and another of 3000 tons, taken by the Eastern Steel Company. The demand for plain shapes continues irregular. The new price basis, 1.50c. minimum, delivered here, now appears to be firmly established for plain shapes.

Sheets.—Irregularity still characterizes the demand, which is confined to a large degree to small prompt lots. Price concessions have not resulted in any larger volume of business, although some inquiry has resulted, but consumers are still disinclined to place orders for anything beyond near future needs. Mills in this district continue fairly active, but have little forward business on their books. The following range of prices is now quoted by Eastern makers, f.o.b. mill, for moderate lots for early shipment: Nos. 18 to 20, 2.30c.; Nos. 22 to 24, 2.40c.; Nos. 25 and 26, 2.50c.; No. 27, 2.60c.; No. 28, 2.80c.

Bars.—The market is still unsettled. The recent reduction in the price of steel bars has resulted in a pretty general withholding of business, the trade waiting to see if actual bottom had been reached. While the reduction in steel bars has not affected the price of refined iron bars, transactions in the latter have also been extremely light. Prices of both steel and iron bars now appear to be well held, the former at 1.40c., and the latter at 1.27½c. to 1.35c., delivered here.

Coke.—A somewhat better movement in foundry coke is to be noted, buyers in instances taking 1000 ton lots for delivery over the remainder of the year, and also for a full twelve months, at $2.10 to $2.25 at oven. There has also been more selling of prompt coke at prices ranging from $1.90 to $2.10 at oven. The United States Government has an inquiry out for an additional lot of 2000 tons of foundry coke for delivery over twelve months. Very little business has been done in furnace coke, and prices are practically unchanged. The following range of prices per net ton is named for deliveries in this vicinity:

Connellsville furnace coke	$3.70 to $4.05
Foundry coke	4.10 to 4.55
Mountain furnace coke	3.30 to 3.65
Foundry coke	3.70 to 4.15

Old Material.—Consumers show little interest in the market, and the major portion of recent transactions have been between dealers. Railroad lists now out in this district show but a medium amount of old material offered. Very little movement in heavy melting steel is to be noted; one transaction, involving 1000 tons, partly rails, was taken by one of the steel mills at $13.25, delivered. Small lots are available at $13, but no seller is willing to dispose of any quantity at quoted prices. The market in the rolling mill grades is particularly quiet. Prices are largely nominal, owing to the lack of sales, but are believed to be pretty close to the bottom. Sellers' ideas for small lots delivered in buyers' yards, eastern Pennsylvania and nearby points, carrying a freight rate from Philadelphia varying from 35c. to $1.35 per gross ton, being named as follows:

No. 1 heavy melting steel scrap	$13.00 to $13.25
Old steel rails, rerolling	14.00 to 14.25*
Low phosphorus heavy melting steel scrap	16.75 to 17.25
Old steel axles	19.25 to 19.75*
Old iron axles	24.00 to 24.50*
Old iron rails	16.75 to 17.25
Old car wheels	13.00 to 13.50
No. 1 railroad wrought	15.00 to 15.50
Wrought iron pipe	12.00 to 12.50
No. 1 forge fire	10.50 to 11.00
No. 2 light iron	7.00 to 7.50*
Wrought turnings	8.25 to 8.75
Cast borings	7.75 to 8.25
Machinery cast	13.00 to 13.50
Railroad malleable	11.50 to 12.00
Grate bars, railroad	10.50 to 11.00
Stove plate	10.00 to 10.50

*Nominal.

New York

NEW YORK, June 7, 1911.

Pig Iron.—Inquiries are light and transactions are few. Occassionally a fair-sized quantity is sold, but generally this means the closing up of negotiations which have been proceeding for some time. Among the sales thus made was one of 2000 tons of charcoal pig iron. Consumers in this locality have either covered their requirements as far as they care to go or content themselves with purchasing small lots to meet their immediate necessities. Southern pig iron is now quoted at prices enabling it to compete with Northern iron in this vicinity. Northern iron at tidewater is quoted as follows: No. 1 foundry, $15.50 to $15.75; No. 2X, $15.25 to $15.50; No. 2 plain, $14.75 to $15. Southern No. 1 foundry is quoted at $15.25 to $15.75; No. 2, $14.75 to $15.25.

Finished Iron and Steel.—The week has been very dull. Sentiment regarding the immediate future is mixed. Purchases have been for immediate wants The general opinion is that present conditions will continue without much change for a number of weeks. One advantage claimed for the publicity given to the recent cut is the focusing of the attention of the general public on the timeliness of settling, at this time, impending projects. Local business in plates is still affected adversely by the boiler makers' strike, but the mills seem to be able to continue working at nearly 70 per cent. capacity. Bar iron is dull, but hardly weak, some good orders being reported at fair prices. There is little to report in new business of large size. Some 5000 tons of plates for 10 torpedo boats are wanted by the navy and 2000 tons for two revenue cutters to be built by the Newport News Shipbuilding & Drydock Company. Some of the recent bidding includes 400 tons for a railroad station at Newark, N. J.; 600 tons for a hotel at Richmond, Va.; 2500 tons for a high school at Philadelphia, and 700 tons for a textile mill at Chicopee, Mass. The Carnegie Steel Company is low bidder for 4000 tons of plates and 1500 tons of shapes for the United States collier Jupiter being built at the Mare Island Navy Yard. The 4000 tons of reinforcement and tower construction of the Williamsburg Bridge, New York, is expected to go to the Snare & Triest Company, New York, the lowest bidder. The 6000-ton Bamberger department store job in Newark, N. J., has by this time probably been given to the Hay Foundry & Iron Works, New York. The Eastern Steel Company has been awarded the 1200-ton American Express building at Eleventh avenue and Thirty-second street, New York, and L. F. Shoemaker & Company have the 2400 tons of structural work in connection with the coke oven plant of the Didier-March Company at South Bethlehem for the Bethlehem Steel Company. The 1800 tons for the Jarmulowski bank and loft building have been given to the Radley Steel Con-

THE IRON AND METAL MARKETS

struction Company. Quotations are: Plain structural material and plates, 1.51c. to 1.56c.; steel bars, 1.41c. to 1.46c.; bar iron, 1.30c. to 1.40c., all New York. Plain material and plates from store, New York, 1.80c. to 1.90c.

Cast Iron Pipe.—Bids were opened June 5 for 1205 tons of 30-in. water pipe by the city of Yonkers, N. Y. The lowest bidder was an eastern Pennsylvania company which named $21.35 per net ton, delivered. No public lettings of importance are in sight in this immediate locality. The general market continues very quiet. Carload lots of 6 in. are quoted at $21 to $22 per net ton, tidewater.

Old Material.—Dealers report no indications of an early resumption of activity. The transactions of the week are confined to small lots. An inquiry is out for a few thousand tons of heavy melting steel scrap, but the price offered is below the terms that would be accepted by yardmen who are not disposed to part with their stock, except at rather higher figures than are now ruling. The demand for cast scrap is light, and only for small quantities. Quotations are about as follows, per gross ton, New York and vicinity:

Old girder and T rails for melting	$10.50 to $11.00
Heavy melting steel scrap	10.50 to 11.00
Relaying rails	20.0C to 21.00
Rerolling rails	12.00 to 12.25
Standard hammered iron car axles	22.00 to 22 50
Old steel car axles	17.25 to 17.75
No. 1 railroad wrought	13.00 to 13.50
Wrought iron track scrap	12.00 to 12.50
No. 1 yard wrought, long	11.50 to 12.00
No. 1 yard wrought, short	10.00 to 10.50
Light iron	4.25 to 4.75
Cast borings	5.25 to 5.75
Wrought turnings	6.25 to 6.75
Wrought pipe	10.00 to 10.50
Old car wheels	11.00 to 11.50
No. 1 heavy cast, broken up	11.00 to 11.50
Stove plate	8.50 to 9.00
Locomotive grate bars	8.50 to 9.00
Malleable cast	10.00 to 10.50

Metal Market

NEW YORK, June 7, 1911.

The Week's Prices

Cents Per Pound for Early Delivery.

	Copper, New York.			Lead.		Spelter.	
June	Lake.	Electro-lytic.	Tin. New York.	New York.	St. Louis.	New York.	St. Louis.
1	12.45	12.25	46.30	4.37½	4.22½	5.50	5.20
2	12.45	12.25	46.65	4.37½	4.22½	5.50	5.20
3	12.45	12.25	.....	4.37½	4.22½	5.50	5.20
5	12.45	12.25	47.50	4.37½	4.22½	5.50	5.20
6	12.45	12.25	48.00	4.37½	4.22½	5.50	5.22½
7	12.45	12.25	48.25	4.37½	4.22½	5.55	5.25

Pig Tin reached a record price in London yesterday and in this market this morning it was within ¾c. of the highest price ever paid here. Copper is firm and excellent sales have been made for export. Lead is somewhat stronger. Inquiries for large lots of spelter have advanced that market slightly. Antimony is much weaker.

Copper.—The copper market is firmer on the strength of good exports and a large consumption in Europe. The foreign market is the salvation of the copper situation, as just now the deliveries into consumption here are not large. Some fairly good business was done during the week, but the largest consumers show no great interest in the situation. The United Metals Selling Company is making the market just now and its price is 12.45c. for lake and 12.25c. for electrolytic. Some big selling interests are demanding more and many predict a higher market within the next few weeks. A heavy business is being done in London in copper, and from private reports received in this country the trading is legitimate, as the copper is going into consumption. The speculative element in London seems to be letting copper alone at present. This morning that market was firm and steady at £55 10s. for spot and £56 1s. 3d. for futures. The exports of copper so far this month have been 4981 tons, which is heavy for six days' shipping. L. Vogelstein & Co. give the following figures on German consumption of foreign copper for the months January-April, 1911: Imports of copper, 57,849 tons; exports of copper, 2654 tons; consumption of copper, 55,195 tons, as compared with consumption during the same period in 1910 of 54,663 tons. Of the above quantity 50,261 tons were imported from the United States.

Pig Tin.—Spot tin is bringing the highest price on record in London and wild excitement prevailed in that market yesterday and to-day as the immediate supplies are closely cornered and traders are scrambling for the few lots offered for sale. Yesterday the London market went up to £220 for spot, and the only time that that price has been approached was on May 14, 1906, when tin for prompt delivery sold for £215. Regardless of the high price made yesterday only 140 tons of metal changed hands. In this market conditions have completely reversed during the week. Seven days ago the American market was thought to be in a state of fair security from a corner as far as the immediate supplies were concerned and tin was being sold at below the import parity. It leaked out yesterday, however, that 250 tons of tin were sent to Europe on Saturday and prices here advanced sharply in consequence. Consumers entered the market and bought to cover their needs for the next month. Most of them purchased sparingly but the volume of trading was good. The market just now is uneasy as present conditions may be continued indefinitely in spite of the fact that tin consumers' needs are small at present. The New York market has now gone beyond the price where it can be imported at a profit and this may stop the re-exporting of tin to London. On the other hand, none but those in control of the London market can tell where prices will go there, and some speculative mortals may see fit to export tin on the chance that the foreign market will advance further. This morning the London market was slightly easier at £215 for spot and £193 15s. for futures, while the market here was 48.25c. and showed signs of advancing. The arrivals of tin in this country so far this month have been 380 tons and there are 1003 tons afloat, all of which will be in port before the month is out.

Tin Plates.—The foreign tin plate market has advanced in keeping with the high price made by the pig tin syndicate, which is in charge of the London market, and to-day tin plates at Swansea, Wales, were selling at 13s. 9d., which is an advance of 5d. in two weeks. This price makes it almost prohibitive to buy tin plates for re-export, and there is a likelihood that domestic plates will be utilized by people who usually purchase for re-export if the foreign market continues high. At present the domestic demand is quiet and quotations are firm in New York with 100 coke plates selling at $3.94.

Lead.—Lead is somewhat firmer, but the demand is light, and consumers are only buying where concessions are made. The New York market is quoted at 4.37½c., and the St. Louis market at 4.22½c.

Spelter.—Some inquiries for large amounts of spelter have appeared in this market and in St. Louis, and on the strength of this quotations have advanced five points. Spelter is now bringing 5.25c. in St. Louis, and 5.50c. in New York for spot. It can be bought in this market, however, for prompt shipment from the West at from 5.42½c. to 5.45c.

Antimony.—Offers to sell Hungarian and Chinese grades of antimony at low prices have broken the syndicate's hold on the antimony market, and quotations on Cookson's and Hallett's have fallen off. There is not much buying and consumers are giving preference to the cheaper grades. Hallett's is now 8.75c., and Cookson's is down to 9c. The drop in the price of Cookson's amounts to ½c. within a week. Hungarian grades are offered at fair prices from 7.50c.

Old Metals.—The market remains unchanged both as to condition and selling prices, the latter being as follows, New York:

	Cents.
Copper, heavy cut and crucible	11.75 to 12.00
Copper, heavy and wire	11.25 to 11.50
Copper, light and bottoms	10.50 to 10.75
Brass, heavy	7.75 to 8.00
Brass, light	6.50 to 6.75
Heavy machine composition	10.25 to 10.50
Composition turnings	8.50 to 8.75
Clean brass turnings	7.75 to 8.00
Lead, heavy	4.20 to 4.25
Lead, tea	3.95 to 4.00
Zinc scrap	4.25 to 4.30

Chicago

JUNE 6.—Except for a slightly stronger tone in the copper market, the past week offers little of change with reference to metals. No large volume of business is reported and prices are approximately at the same level as a week ago with some slight variations attending upon the character of the order. We quote Chicago prices as follows: Casting copper, 12.45c.; lake, 12.60c., in carloads, for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 47½c.; small

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lots, 49c.; lead, desilverized, 4.35c. to 4.40c. for 50-ton lots; corroding, 4.60c. to 4.65c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.35c. to 5.40c.; Cookson's antimony, 10¼c., and other grades, 9c. to 10c., in small lots; sheet zinc is $7.25 f.o.b. La Salle, in carloads of 600-lb. casks. On old metals we quote for less than carload lots: Copper wire, crucible shapes, 12c.; copper bottoms, 10c.; copper clips, 11¾c.; red brass, 10¼c.; yellow brass, 9c.; lead pipe, 4⅜c.; zinc, 4¼c.; pewter, No. 1, 27c.; tin foil, 33c.; block tin pipe, 36c.

St. Louis

JUNE 5.—Lead shows little feature, the quotations here being 4.22½c., East St. Louis. In spelter there is a slight drop, the figure being 5.20c., East St. Louis. Zinc ore so far shows no change from last week's figure of $37 to $39 per cent. f.o.b. Joplin. Tin is up with other markets, 47c. being the price. Antimony is weak, but without change. On old metals the quotations are: Light brass, 5c.; heavy brass and light copper, 8c.; heavy copper and copper wire, 9c.; zinc, 3c.; lead, 3.25c.; pewter, 20c.; tin foil, 28c.; tea lead, 3c., all for less than carload lots.

Notes on Prices

Rope.—The demand apparently keeps up to the recent level, with no desire on the part of buyers to purchase beyond nearby requirements. The hard fiber market is firm with a slight advance in sisal fiber, while manila fiber is reported as steady. There is more or less variation from regular prices in the lower grades of rope. The following quotations represent regular prices to the retail trade in the Eastern market for rope, 7/16 in. in diameter and larger, with card advances for smaller sizes: Pure manila of the highest grade, 8½ to 9c. per lb.; second grade manila, 7½ to 8c. per lb; hardware grade manila, 7 to 7½c. per lb.; pure sisal of the highest grade, 6¼c. per lb.; second grade, 6c. per lb.; rove jute rope, ¼ in. and up, No. 1, 6½c. to 7c. per lb.; No. 2, 6c. per lb.

Linseed Oil.—The paint business shows some improvement, there being a fair demand for small lots. Carloads are quoted on the basis of raw oil at 87c., and it has been intimated that 10-bbl. lots could be obtained from some sellers at the same figure. The following are New York prices in 5-bbl. lots or more:

	Cents.
State, raw	89
City, raw	90

Oil in lots of less than 5 bbl., 1 cent advance per gallon.
Boiled oil, 1 cent advance per gallon over raw.

Naval Stores.—Since turpentine prices have declined the demand has increased for small lots generally, although some buyers are placing orders for larger quantities. The view of market conditions taken by some is that prices will go still lower, as receipts of turpentine at Southern points are large and stocks are accumulating, although exporters have been buying large quantities. New York turpentine quotations are as follows:

	Cents.
In oil barrels	57½
In machine barrels	58

Less than 5-bbl. lots, ½ cent advance per gallon.

The buying of rosins is generally restricted to nearby requirements. On the basis of 280 lb. to the barrel common to good is quoted at $6.65 and grade D, $7.15 in the New York market.

"A Decade in United States Steel" is the title of a booklet, published by Dow, Jones & Co., publishers of The Wall Street Journal, 44 Broad street, New York. Its purpose is to give the shareholders of the United States Steel Corporation, as well as investors, an insight into its general operations and what has been accomplished by this great industrial organization in the last ten years. The author has gone into the subject in much detail in the effort to point out the uses to which earnings have been put; actual assets added to the property after sinking and depreciation fund charges have been deducted, the extent to which the corporation has safeguarded its shareholders; additional security placed behind the capital stock and bonds, and other developments. The volume contains 45 pages, and is sold at 25 cents per copy.

Iron and Industrial Stocks

NEW YORK, June 7, 1911.

Prices of securities continued their upward movement until Tuesday, when some reaction occurred. There seem to be few exceptions to the general strength in iron and industrial stocks, on which the range of prices from Wednesday of last week to Tuesday of this week has been as follows:

Allis-Chalm., com...	9 - 9¾	Pressed St., pref...	99 -100¾
Allis-Chalm., pref...	32 - 33½	Railway Spr., com..	34¼- 37¼
Beth. Steel, com...	32¾- 33¾	Railway Spr., pref..	101¾-102
Beth. Steel, pref...	62¼- 64⅛	Republic, com.....	29¼- 31
Can., com.....	11¾- 12⅛	Republic, pref.....	93½- 96
Can., pref.....	86½- 88¼	Sloss, com.....	49¼- 50
Car & Fdry., com..	54¾- 59	Pipe, com.....	17⅜- 18
Car & Fdry., pref.....	119½	Pipe, pref.....	58¾
Steel Foundries.....	41 - 43	U. S. Steel, com....	75⅛- 78¾
Colorado Fuel.....	32¾- 34⅞	U. S. Steel, pref...	118 -119½
General Electric.....	163 -166½	Westinghouse Elec..	75 - 78
Gr. N. ore cert.....	60¾- 63½	Va. I., C. & C.....	68½
Int. Harv., com....	124⅛-126½	Am. Ship, com.....	67 - 72¼
Int. Harv., pref.....	125	Chi. Pneu. Tool....	51½- 53
Int. Pump, com.....	40 - 42⅛	Cambria Steel.....	44 - 45¼
Int. Pump, pref....	88¼- 89⅞	Lake Sup. Corp....	27½- 28½
Locomotive, com....	40 - 42	Pa. Steel, pref.....	106½
Locomotive, pref.....	108¾	Warwick	10
Nat. En. & St., com.....	17	Crucible St., com..	13⅜- 14
Pittsburgh St., pref.	103¾-105	Crucible St., pref...	81¾- 84
Pressed St., com...	34¾- 37¼	Harb. Walk Ref., com....	45

The Sharon Steel Company, Sharon, Pa., which was absorbed some years ago by the United States Steel Corporation, has paid off and retired the whole of the outstanding issue of collateral trust and mortgage 5 per cent. 40-year gold bonds, amounting to $60,000. They are dated June 1, 1901, and would have been payable June 1, 1941.

Dividends

The American Car & Foundry Company has declared the regular quarterly dividends of 1¾ per cent. on the preferred and ½ of 1 per cent. on the common stock, payable July 1.

The Ingersoll-Rand Company has declared a semi-annual dividend of 3 per cent. on the preferred stock, payable July 1.

The Standard Coupler Company has declared a semi-annual dividend of 2 per cent. on the common, and 4 per cent. on the preferred, payable June 30.

A novel and interesting demonstration car is on its way to the Atlantic City convention of the Master Car Builders and Master Mechanics. This car contains an upright boiler arranged for using oil fuel and a large oil-fired forging furnace, designed and built by Tate, Jones & Co., Inc., Pittsburgh, with one of the new steam hydraulic forge presses built by the United Engineering & Forging Company. This car will be placed next to the board walk on Mississippi avenue, and it will be in operation daily during the convention making forgings. After the convention it will be taken to different places for demonstrating the value of this type of forge press and furnace.

The Duplex Metals Company, Chester, Pa., announces that its copper-clad steel wire is now manufactured in four grades as follows: 47 per cent. grade, conductivity 44 to 50 per cent., bare wire, 13 cents base; 40 per cent. grade, conductivity 35 to 45 per cent., bare and weatherproof wire, 12½ cents base; 30 per cent. grade, conductivity 25 to 35 per cent., bare wire, 11 cents base; mechanical grade, guaranteed rustless, bare wire, 11 cents base.

The Department of Public Safety, Philadelphia, will receive bids until June 13 for the construction of a flush deck fire and police boat, specifications for which are to be had at the Bureau of City Ice Boats and Dredges, Race street wharf, Delaware River; and for a new crank shaft for engine No. 3, power plant, City Hall, specifications for which may be had on application to the Electrical Bureau, City Hall.

Advices from San Francisco state that on June 3 the creditors of Henshaw, Buckley & Co., machinery dealers, filed a petition against the firm in involuntary bankruptcy. The liabilities are placed at $500,000. Action was begun to stay an execution secured by Los Angeles creditors, and the court issued an order restraining all levies on the firm's property.

Efficiency in the Foundry*

A Discussion of the Movement in Its Various Aspects in the Manufacture of Castings

BY C. E. KNOEPPEL, NEW YORK CITY.

The foundry business, the same as any other business, should be based on mutualism. The executive wants low costs, the men employed want higher wages, and there is no reason why both should not realize their desires. If either ignores the interests of the other, both lose out. The aim, therefore, of scientific management, or whatever you choose to call it, is to bring about this seemingly illogical condition of higher wages and lower costs, through finding the best ways of doing things, and properly adjusting the various relations to the end that the proposition may be in the best possible working condition. If you will think of this doctrine of efficiency in this sense, the possibilities will no doubt appeal to you.

The executive wants results, but he is unable to give more than a general idea as regards what he desires accomplished, so that it is up to his manager to reduce this idea into elements and factors, which he does as well as he can. The foremen are told that they must produce, and depending upon their ability they do as well as is possible in giving out the work, bettering conditions, stipulating how much they want produced, advising the men, etc. The men who finally get and make the work use their ability to a great extent in their own way. If they are not working fast enough or make their work incorrectly, it is not noticed except as the foreman in the travels around the shop happens to observe what is going on, in which case the men receive criticism or advice, as the case may be.

An Inherent Weakness

Because the conditions are often as outlined, it is not strange that through this shifted responsibility more is not accomplished. Men cannot advise themselves, and if the matter of equivalency as to time, number per day, and quality of product are left in a measure to them, or to a hasty observation by the foreman, it follows that because each man through his training is in a sense a law unto himself, the practice is anything but standard. To reverse the order of things, to build from the bottom upward, requires a constructive type of organization that erects on a firm foundation and in a scientific manner a structure that will consider the various elements entering into making the enterprise successful.

Here is a prime consideration—scientific study of the man. In the foundry the work is largely a matter of motion—shoveling, ramming, slicking the mold, making cores, coring, finishing, closing, weighing, pouring, etc. Considered in this light, there are wonderful possibilities ahead of your industry in this particular field. Little, if any, study has been given to motions, trips, extra handling, etc., to determine the best a man can do, day in and day out, without injury to his health, for it should be remembered that scientific management does not mean slave driving.

The psychological side of the man is beginning to receive its share of attention, and again, as regards your industry, there is a productive field awaiting development. We are all more or less governed by self-interest, and as every man possesses such faculties as initiative, imagination, energy, interest and concentration, any appeal to this self-interest awakens each faculty and more is accomplished as a result. Those among you who have made the greatest successes have been inspired primarily by self-interest. You called your imagination into play, dreamed of future successes, drew up mental plans which you desired to carry out, which aroused your interest to such an extent that your whole aim and purpose was centered upon what you had planned mentally. Depending upon your interest and concentration, your faculty of initiative forced you to get up and do, and your energy carried you through to success. These same qualities exist in every man. To what extent have they been developed in those under you? If, in addition, we consider that there is such a thing as a "second wind" in a mental as well as physical sense, the development of this side of a man's make-up is worth while undertaking.

Study of the Man and the Work

In studying men, then, we must analyze what they do and how they do it, eliminate the unnecessary, instruct them how to do the necessary, inspire them with new and fresh interests, furnish them the incentive to use their heads and hands to better advantage, and you can get results from them which will be surprising as well as profitable.

The task is not completed, however, by just studying the man, for there must be a knowledge of what he has to do, as well as how he is to do it. The foreman can hand a molder a pattern; the molder can have a flask brought in; he can make and pour the mold, but he assumes a greater responsibility than is really his. Study will soon demonstrate that there is the unnecessary in the operations that go to make a job, jut the same as there is the unnecessary in the work of the man. If the molder goes for gaggers, and then in setting them takes longer than is necessary, you have a double inefficiency, so that in studying the work the operation of going for gaggers would be eliminated, for the very good reason that a concern does not get productive capacity out of a molder when he is doing something that can be done for him by those less skillful and at less expense. This illustration holds as regards other items, such as mixing facing, going for nails, chucking or tightening flasks, and a number of other details that a study will reveal as existing to a degree in almost every foundry. Eliminate these unnecessary features, and you can standardize the operations; you can plan more intelligently, and you can put the responsibility for making a good mold squarely up to the man and not a responsibility that is likely to be detrimental to his interests, through furnishing him with tools and rigging that may not be best for the job in question, making him wait unnecessarily, etc.

After you have studied the work, separated the productive elements from those which are merely preparatory operations, it is then up to the management to assume full resposibility for bringing these conditions to the highest degree of efficiency. The molder, in a broader sense, is only the medium between the finished casting and what he is given to work with, as well as the conditions under which he works. We are all familiar with what he uses in his daily work, and as a molder can work efficiently only when he can use to advantage such items as patterns, cores, flasks, sands, nails, tools, etc., it would certainly pay to have this end of the work at its best. In a brief way the conditions capable of study and betterment are:

1. Foundy orders—knowledge of and their following up. 2. Storage and handling of materials, supplies, etc. 3. Selection of patterns, sweeps and core boxes. 4. Repairing and altering the above. 5. Selection of flasks. 6. Repairing and altering the above. 7. Flask storage, piling, etc. 8. Removal of castings, gaggers, rods, etc., from the sand. 9. Tempering of molding sand for use by molders. 10. Mixing of facing sand. 11. Shop carrying arrangements. 12. Supplying the molders with facilities. 13. Furnishing the molder with proper tools. 14. Crane facilities. 15. Arrangements as regards the general shop labor.

Faulty Dispatching

One of the reasons for inefficiency in industrial endeavor is a lack of, or faulty, planning, or dispatching, as it has been properly termed, the assumption of which is—no work is ready until everything is, or will be ready for the work. If the molder has to wait for a job, or pattern, or flask, or his cores, or to have new bars placed in his cope, faulty planning is responsible for inefficiency, which taxes the work with more than it should cost.

If dispatching is placed at the service of the men as regards jobs, patterns, flasks, cores, rigging, special features, conditions, the night work, supplies, crane service, tools and equipment, shop labor, etc., it would be but a short time before gains due to this one feature of the work would be such as to convince you beyond any possibility of questioning as regards the merit of efficient dispatching.

With dispatching so arranged to eliminate waits and delays; with conditions in the best possible state for working to advantage; with the work standardized both as to pro-

*Presented before the American Foundrymen's Association, Pittsburgh, May 24, 1911.

ductive operations and as to time in which they should be done; with the men under proper direction giving their best energies, who is there unwilling to divide with them a share of the gain due to the elimination of waste and unnecessary effort? This would stimulate them, awaken a self-interest, and they would not only willingly assume their legitimate responsibility, but co-operate with you in turning out more.

This reward would be based upon individual merit according to the efficiency of each man, as shown by the relation existing between the time actually taken by him and what he should have taken on work that had previously been studied and standardized. In addition, rewards would be entirely distinct from wages, so that the men would have everything to gain and nothing to lose; in fact, the more a man could earn the better, for this would mean a higher efficiency, which stands for a low cost.

Lake Superior Mining Conditions

Activity in Acquiring New Mines and in Making Explorations

DULUTH, June 3, 1911.—As yet there is no improvement in mining conditions on Lake Superior. Last year the Duluth, Missabe & Northern Railroad handled about 13,500,000 tons of ore to Duluth; its schedule for this year is not much more than half of that amount, or 7,500,000 tons. The Duluth & Iron Range is cut in about the same proportion. On the other hand, the Great Northern's schedule is increased somewhat, and is in the neighborhood of 9,500,000 tons. According to the present figures there will be shipped from the Minnesota ranges not to exceed 22,500,000 tons, which is to be compared with 30,500,000 tons for the preceding year. This is in spite of the fact that the new Cuyuna range commenced shipments this season, and diminishes, by just so much more, the totals of the two older districts. To be sure the Cuyuna's output this year will be very small, probably not in excess of 250,000 tons, if so much. But the general feeling is one of hope, and it is expected that the year will be an accelerating one, and many feel that the fall will show everything busy and a demand for heavy shipments.

Lake shipping interests are suffering materially. Of the many independent fleets a few have not outfitted a single ship, others have a moiety of their vessels running. One large independent inetrest, with seventeen large ships, had but two in commission to May 20; it is now outfitting others, and will have a good part of its boats rununing in June. The coal business is heavy, and crop prospects are unsurpassed, but coal is brought up the Lakes as a sort of by-product, and grain is now but a trifling factor at best in the point of tonnage.

Why Leased Mines Are Worked to the Limit

Naturally, mines are running under check. On the Marquette range the Lake Superior Iron Company has cut down its time to four days per week, without any reduction in the number of men employed, and many other properties have reduced. On the Vermillion range the Steel Corporation mines will move as little ore as possible, while on the Mesaba a number of the large properties are idle. In these cases, however, the reductions are not entirely the result of dullness, but combined with other reasons, as, for instance, the requirements of the corporation for heavy minimum shipments out of leased mines, the leases on some of which are drawing to expiration.

There is such a tremendous gross amount of ore to be produced to fill minimum requirements on long time leases, and so much on leases that have but a few years to run, that all mines owned in fee will be conserved, not only now, but for some time to come. It is admitted by those knowing conditions that any leases about to expire will be renewed only at a royalty rate far higher than has been paid in the past. In this event it is the policy of the lessees, whether they be the Steel Corporation or others, to mine as much as possible at the present rates, and take as great advantage of the situation as possible. In this connection there are to be considered the questions of equipment and advance development. The greater the tonnage this is spread over, the lower will be the cost of production, and for this reason it is necessary to clean out as much ore as possible before leases expire.

Activity in Acquiring New Mines

The activity in Lake Superior mining operations of a number of the independent steel makers has been somewhat overlooked. Such concerns as M. A. Hanna & Co., Jones & Laughlin Steel Company, Rogers, Brown & Co., Inland Steel Company, Pickands, Mather & Co., Shenango Furnace Company, Republic Iron & Steel Company and some others have been very active in the acquirement of mines and in the development of new properties. Most of them have been quite recent in this work, though Pickands, Mather & Co. and the Republic Iron & Steel Company, having been fairly well fortified with mines some time ago, have not been so anxious for more.

M. A. Hanna & Co., for example, have added an average of four or five new mines a year for several years, and are still exploring. They are scattered over the various districts, especially on the western Mesaba and in the Iron River section of the Menominee. While many of their mines are comparatively small, as tonnages now go, they have amassed a very important aggregate of various grades, and have placed themselves in an exceptionally well intrenched position.

The Jones & Laughlin Steel Company now has a total of ten operating mines, of which three are in Ishpeming and the rest on the Mesaba. The company recently bought the fee of the Nassau mine, at Hibbing, which had been under lease to M. A. Hanna & Co., but that had never been operated. It adjoins a Jones & Laughlin property that is now active, and the two can be operated as one with much economy. The company is exploring on the Menominee.

Rogers, Brown & Co. have of late been more interested in developing the Cuyuna than other districts, and have several good mines there, notable among which is the new Meacham, on which a large working shaft is being sunk. This is a deep and large deposit of high grade ore, considerable of it of Bessemer grade. It contains 15,000,000 tons, and is owned in fee by the Pine Tree Lumber company, a Weyerhaueser timber interest. The Inland Steel Company has several properties, among which are Menominee, Mesaba and Cuyuna range lands.

Initial shipments from the Cuyuna were made last month from the Kennedy mine, owned by Rogers, Brown & Co. It is not unlikely that the grade of this shipment will be disappointing, as the ore was taken from development and is much mixed. Still, there will be no little interest in results, if they can be learned. In general, affairs on the Cuyuna are somewhat quiet, and are confined almost completely to a section in the immediate neighborhood of the west side of Rabbit Lake and in towns 46 and 47, range 29. Some ore of very high grade has been found in the lower part of town 136, range 26, north of and within half a mile of the Mississippi River, and a deep hole is to be drilled there to test the formation at 1000 ft. or more. This is, so far as I know, the only find of good ore north of the Mississippi on that range.

Activity in Explorations

There is a surprising amount of activity, considering general conditions, in explorations. This is not alone in old and well-known fields, but at other points. Work is under way on a considerable scale at various points of the Atikokan range; and while there is not yet much actual drilling, preliminaries are shaping themselves for that. The same is true of a certain region on the western side of Itasca County, Minn., far north of the Mesaba range. It has been found that there are various well defined lines of attraction in that vicinity. Near the little station of Beechwood, eight miles west of Iron River, Menominee range, there is an attractive situation, and it is to be drilled. Exploration on the Vermillion continues as for some time past, with one or two additional operators in the field. At the Camp property of the Vermillion & Mesaba Iron Company a testpit is now some 45 ft. in high grade hard ore that shows all the earmarks of Vermillion ore. Elsewhere, so far as is learned, conditions remain as they were some weeks ago.

At Crystal Falls a new shaft is being sunk at the Bristol mine by Oglebay, Norton & Co., and there is to be a large product this year. This shaft is steel construction, wood lathed, and with one exception, that of the new Maas shaft at Negaunee, is the most pretentious operation of the kind now under way on Lake Superior. D. E. W.

Utilizing Blast Furnace Wastes*

Enormous Economies in Power from Gases, Portland Cement from Slag and the Saving of Ore Dust

BY EDWARD M. HAGAR.†

Until the last decade practically the only utilization of the wastes or by-products of a blast furnace was the use of a portion of the waste gases to raise the temperature of the incoming blast through heating the brick work in hot stoves, and in some cases a small portion of the power value of the gases was obtained by burning them under boilers to generate steam for driving the blowing engines.

At the present time the calorific value of the waste gases is being utilized directly in gas engines for blowing purposes and for generation of electric power; a considerable portion of the slag is used in the manufacture of Portland cement, and the flue dust, consisting of the finest ore and coke particles, is being collected and converted so as to be rechargeable into the furnaces. The aggregate saving of profits resulting from these three developments is a matter of millions of dollars per annum, and in a modern blast furnace plant it would almost seem that pig-iron was the by-product; and, indeed, the investment in the equipment to utilize these former wastes exceeds that of the blast furnace itself.

The writer in his work has come in contact with these evolutions, with plants in operation or under construction, of a capacity to produce 12,000,000 barrels of Portland cement per annum from slag and limestone, using over 1,300,000 tons of slag in a year, these plants being driven entirely by electric current generated by gas engines directly from the waste blast furnace gases, the power requirements being 40,000 hp for 24 hours every working day. In one of the cement plants the first commercial method for reclaiming flue dust was discovered.

The United States Steel Corporation, of which the Universal Portland Cement Company is a subsidiary, has already installed 250,000 hp gas blowing and gas electric units, which, it can easily be figured, displaces or saves the consumption of approximately 1,000,000 tons of coal per annum as compared with the old-fashioned method.

Utilizing the Ore Dust

With the modern high blast pressures and the use of fine Mesaba ore the finest of the particles together with the coke dust are blown out through the top of the furnaces and are caught in the flues, dust catchers and gas washers. The iron ore in this dust amounts to fully 3 per cent. of the total ore charged, which aggregates the large amount of approximately 1,250,000 tons per annum in this country. Until within a few years this dust has been thrown away or used as filling, although containing about 40 per cent. metallic iron. For many years efforts were made to use this material by compressing it into briquettes, but the cost of the operation, together with the fact that the briquettes disintegrated and the dust was again blown out, led to an abandonment of the briquetting plants.

The first commercially successful method of utilizing the dust was discovered by passing the material through the cement kilns at South Chicago. Experiments showed that with the proper heat treatment the coke dust could be burned off and the iron ore conglomerated into nodules or nuggets averaging over 60 per cent. iron content. These nodules when fed to the blast furnace were easily and completely reduced. The fact that the sinter of the flue dust contains such a high percentage of iron and that all of the sinter is reduced, together with its physical shape assisting the steady movement of the charge downward in the blast furnace, thereby preventing so-called slips, makes the sinter more valuable per ton than any ore. It was necessary to derive mechanical means for preventing the accumulation of the sinter on the walls of the kiln. Plants have been in operation for some years using this process, with endless chains carrying scrapers constantly passing forward through the kiln and cooled in water on their return outside of the kiln. Recently other methods of utilizing dust have been devised which may prove successful commercially, and the indications are that within a short time the greater portion of this former waste will be prevented.

*From a paper read before the Congress of Technology, Boston, Mass., April 11, 1911.

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The Growth of the Portland Cement Industry

The development of the Portland cement industry in this country and the extension of its uses have been marvelous. The following table shows the remarkable increase in the production of Portland cement in the United States every year since 1895, when this country first reached the production of approximately 1,000,000 barrels:

Year.	Production of Portland Cement in U. S. Barrels.	Production of Universal Portland Cement. Barrels.	Percentage of Universal to the Total.
1895	990,324	.....	....
1896	1,543,023	.....	....
1897	2,677,775	.....	....
1898	3,692,284	.....	....
1899	5,652,266	.....	....
1900	8,482,020	32,443	.39
1901	12,711,225	164,316	1.29
1902	17,230,644	318,710	1.85
1903	22,342,973	462,930	2.08
1904	26,505,881	473,294	1.78
1905	35,264,812	1,735,343	4.92
1906	46,463,424	2,076,000	4.55
1907	48,785,390	2,129,000	4.36
1908	51,072,612	4,535,000	8.89
1909	62,508,461	5,786,000	9.27
1910	73,500,000*	7,001,500	9.52

*Government estimate.

It may be of interest to note the increasing percentage of the total American production shown by Universal Portland cement, which is the only Portland cement manufactured in this country using slag as one of the raw materials. With the new plant now approaching completion, the aggregate production of Universal Portland cement in the Chicago and Pittsburgh districts will amount to over one-eighth of the country's total. Expressed in weight, the output of the finished product will be over 2,000,000 gross tons per annum. Our plants in the Chicago district will consume all the available slag that is suitable for the purpose from an aggregate of 19 blast furnaces in the South Chicago Works of the Illinois Steel Company and in the Gary Works of the Indiana Steel Company.

Comparing the pig-iron production and Portland cement production of this country in figures of gross tons, the percentage of Portland cement to pig-iron in 1890 was 0.006 per cent., in 1900 10.3 per cent. and in 1910 47 per cent. The continuation of any such relative growth would mean that before 1920 the tonnage of Portland cement would considerably exceed that of pig-iron. I would hesitate, however, to predict that such would be the case.

Portland cement is defined by the United States Government as the product obtained from the heating or calcining up to incipient fusion of intimate mixtures, either natural or artificial, of argillaceous with calcareous substances, the calcined product to contain at least one and seven-tenths times as much of lime, by weight, as of the materials which give the lime its hydraulic properties, and to be finely pulverized after said calcination, and thereafter additions or substitutions for the purpose only of regulating certain properties of technical importance to be allowable to not exceeding 2 per cent of the calcined product.

From this definition it will be seen that the raw material for Portland cement is not limited to any particular form of material. It may be made from any combination of materials that together furnish the proper elements. In this country Portland cement is manufactured from a number of raw materials, which, with a few exceptions, may be classed under four heads: 1. Argillaceous limestone (cement rock) and pure limestone; 2. clay or shale and limestone; 3. clay or shale and marl; 4. slag and limestone. In all cases the raw mixture is a combination of some form of clay and some form of lime, and in the first and fourth classifications the clay materials contain some lime. This simply reduces the proportion of lime material necessary for a proper mixture.

The Method of Manufacture

In the manufacture of Portland cement from slag and limestone the molten slag flowing from the furnaces is granulated by a stream of water, loaded into cars and transported to the cement plants, where it is dried in rotary driers, and receives the first grinding it is then mixed in automatic weighing machines, with the proper proportion of ground and dried calcite limestone. These are then ground together and burnt to a hard clinker at a temperature of nearly 3000 degrees Fahrenheit in rotary kilns, using pulverized coal for fuel.

This clinker, after seasoning, is crushed and ground and mixed with a small percentage of gypsum to regulate the setting time. The cement is ground to such fineness

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Mechanical and Civil Engineers
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that 96 per cent. passes through a sieve having 10,000 meshes, and 80 per cent. passes a sieve with 40,000 meshes to the square in. It is then conveyed to the stock house for storage prior to shipment.

It is necessary to use as a flux in furnaces supplying slag for cement manufacture a pure calcite limestone. The limestone burnt with the slag must also be a pure calcite stone. It is also essential that the ores be of a uniform and proper character. Inasmuch as Lake Superior ores are noted for their remarkable uniformity of analysis, the resultant slag obtained from the use of these ores and a pure calcite limestone is more uniform in its analysis than any form of natural clay deposit used in the manufacture of Portland cement, and the variation in the proportions of the two raw materials used in the manufacture is less than those of any other materials mentioned above. In addition, the opportunity for analysis and selection of the proper ingredients through the use of an artificial material is a great advantage as compared with the necessitous use of natural materials just as they are found with their variations in analysis at different depths. In the intense heat of the kiln, under the influence of the oxidizing flame, any sulphides in the slag are completely burned out.

The rotary kiln commonly used 10 years ago was 60 ft. long and 6 ft. in diameter. This has gradually been increased in length and diameter until the modern kiln is 140 to 150 ft. long and 8 to 10 ft. in diameter, and there are a few even larger kilns in use. Kilns are usually set at an incline of ¾ in. to the foot. With the lining and contents the modern kiln weighs 150 tons, and in revolving upon two bearings presents interesting constructional features.

The method of manufacture described is the standard method of manufacturing Portland cement from natural deposits, and the finished product differs in no way from other Portland cements in chemical analysis, fineness, specific gravity, color, nor in the operation in practical work. It has no peculiarities whatever and has no limitations to its applications. There is no difference, from the chemist's point of view, between the manufacture of Portland cement from natural deposits, such as limestone and clay or shale, and its manufacture from limestone and slag. Slag is reallly a mixture of the clay from the ore with the lime content of the stone used as a flux in the furnace.

Our method of manufacture of Universal Portland cement does not embody any real invention, nor is it based on any patents. It is simply an adaptation to an artificial raw material of the regular Portland cement process formerly applied only to natural deposits.

True Portland cement, in which slag is used as one of the raw materials, should not be confused with Puzzolan or so-called slag cements, which are simply mechanical mixtures of slag and slaked lime ground together without burning. Such cements are suitable only for use under ground and in moist locations. The manufacture of Puzzolan cements in this country has practically been abandoned.

Welfare Work of Electric Lighting Companies.—The National Electric Light Association at its annual convention in New York City last week adopted the report of its special committee favoring profit sharing with employees, old age pensions, accident and life insurance, death benefits and employees' savings and investment funds. This report was referred to at some length in *The Iron Age* of April 20, 1911, on page 973. In that article the names of the members of the committee were given. The report was adopted after a brief discussion, without a dissenting vote. It was presented by Samuel Insull, president of the Commonwealth Edison Company, Chicago, who stated that the scheme had been put into practice in some of the great electric lighting plants to test it, and the result was highly satisfactory.

J. K. Dimmick & Co., Philadelphia, are discontinuing their general Western selling office at Cincinnati and will transfer it to Cleveland, Ohio, as more advantageous for a large and increasing lake business. Charles E. Pool, who has been the sales agent at Cincinnati, will have charge of the Cleveland office, to be located at 1242 Rockefeller Building, from which he will sell their Stonerite, New River smokeless coal, Fairmont coal and Connellsville coke.

Vanadium in Cast Iron*

BY GEORGE L. NORRIS.†

The use of vanadium in gray iron castings has been limited when compared with its use in steel castings, although the past year has shown a marked increase, and its use in certain classes of castings has become well established. In the case of steel, we have a refined metal with certain physical properties not possessed by cast iron, and susceptible of improvement by heat treatment. In the case of cast iron we have a material that has undergone very little or no refinement, and is only slightly different from the crude pig iron from which it was produced. Its only metallurgical treatment is usually a simple melting operation with or without scrap cast iron and steel.

Undoubtedly the greater portion of the iron castings made to-day are satisfactory, so far as the quality of the iron is concerned, to meet the requirements for which they were designed, although a large percentage could with advantage be greatly improved in quality.

Cost of Castings Must Not Be Greatly Increased

We have then, in the case of cast iron, a material, the cost of producing which from the crude pig iron has been slight. The price at which iron castings in general are sold precludes the use of any alloy for affecting the quality of the material that will increase the cost materially, excepting in the case of certain classes of castings where unusual strength or some special quality in the iron is desired. In such cases even a very material increase in the cost of the castings is readily accepted.

In the case of vanadium we are dealing with a metal of fairly high price and its use in the manufacture of cast iron naturally will be confined to the classes of work that can stand a material increase in cost in return for the special qualities obtained. The addition of 1/10 per cent. of vanadium to cast iron at the present price of $5 per lb. means an increase of ½ cent a pound for the iron in the ladle, and necessitates an increase in selling price of ¾ cent to 1 cent a pound at least to cover losses due to scrap, gates, sprues, etc.

I am mentioning these points not for the purpose of discouraging the use of vanadium in cast iron, but because we have frequent inquiries which show that they are not thoroughly understood. Some of these inquiries indicate a belief that vanadium is a panacea for all foundry troubles including cold melted iron. Vanadium has been applied to cast iron with great success for certain purposes and the results obtained indicate its effective application in other lines.

Vanadium Adds Strength

While vanadium has a strong affinity for oxygen and nitrogen and is partly used up by combining with these elements, the primary purpose of adding vanadium to cast iron is not the removal of oxygen and nitrogen. The removal of oxygen can be effected sufficiently well by cheaper means and as the injurious effect of small amounts of nitrogen on a refined metal, such as steel, is still an open question, the harmfulness of this element on a metallurgically crude metal like cast iron is open to still greater doubt. The object of the use of vanadium in cast iron, then, is to give certain qualities to the iron, and to do this the vanadium must enter into the cast iron as a component part.

Vanadium increases the strength of the cast iron to which it is added from 10 to 25 per cent., depending, of course, upon the initial strength of the iron. This increase of strength is due directly to the intensifying effect of the vanadium on the metals present in the cast iron alloy, such as silicon and manganese, and also by combination with the chemically combined carbon.

It exercises a very strong effect on the grain of the iron, causing a more even distribution of the graphite with consequent greater freedom from both hard and porous spots. This effect is very apparent, vanadium cast iron fractures showing a finer and more uniform grain. In the case of chilled iron, vanadium produces a deeper, stronger and tougher chill, and one less liable to spall or flake. This

*Paper presented before the American Foundrymen's Association, Pittsburgh, May 24, 1911.

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chill, however, is not so hard apparently as the more brittle chill of ordinary chilling iron, and can be filed and machined more readily.

Vanadium also gives an element of toughness to cast iron, which is very apparent in machining the castings. This toughening effect together with the uniform fineness of grain or texture due to even distribution of graphite in small flakes makes vanadium cast iron very superior for such purposes as gas and steam-engine cylinders, valve and piston bushings, piston rings, glass bottle molds, gears, castings to withstand heat and internal pressures of fluids and gases without leakage.

How Engine Cylinders Have Been Improved

Three or four years ago the New York Central Lines equipped one of its locomotives with a pair of vanadium cast iron cylinders. The performance of this pair of cylinders over a test period of about two years was so satisfactory that 500 or more locomotives on these lines are now equipped with vanadium cylinders. The test of the original pair demonstrated that over twice the normal mileage of ordinary cast-iron cylinders could be obtained from vanadium cylinders before reboring. The loss in casting these cylinders was extremely low, no cylinders being scrapped at all for the first 183 locomotives ordered. The same sort of results have been reported by a builder of large gasoline engines for marine use. In this particular case the number of cylinders formerly lost when tested after machining was excessive, due to porousness of certain sections. Piston rings and cylinder and valve bushings of vanadium cast iron have been thoroughly tried out and adopted by a number of leading railroads on account of the greatly increased length of service obtained.

A very interesting application of vanadium has been for glass bottle molds. These, as you are well aware, are chill castings, and are usually covered with engraving. The iron has to be clean, close and uniform in grain, machineable, and take a good polish. The first vanadium cast iron bottle molds were made a little over a year ago and proved not only to have a longer life but it was found possible to increase the speed of the bottle machines as the glass did not appear to stick to these molds to any extent. This can be readily accounted for by the uniformity of the grain and freedom from mottled spots.

Chilled Rolls

One of the first applications of vanadium to cast iron was in chilled iron rolls for sheet mills. A number of these were made and gave excellent results, some of them showing 50 per cent. greater tonnage with one half the dressing against the regular chilled roll. The question of cost, however, entered in here in an unusual manner. Fully 65 to 70 per cent. of the roll breakages are due to accidental causes, and no amount of vanadium would insure, for instance, against a roller letting a pair of tongs pass through the rolls.

We have had opportunity from time to time to make comparative tests of the strength of cast iron with and without vanadium, extending over a considerable period, and believe that these comparisons are more nearly representative than single tests as they represent average conditions.

The following tests are the average for ten consecutive days' work on locomotive cylinders. The transverse tests were made on bars 1 in. square, 12 in. between supports: the bars were machined all over and consequently were absolutely comparable, which is not always the case with bars only brushed or cleaned.

	Transverse.	Tensile.
Plain cast iron	2,130 lb.	24,225 lb.
Vanadium cast iron	2,318 lb.	28,728 lb.

This iron has stood 750 lb. water pressure for sections ¾ in. thick. The average chemical analysis of this iron is about as follows:

Combined carbon	0.50
Silicon	1.50
Manganese	0.45
Phosphorus	0.60
Sulphur	0.095

The following tests were supposed to be from iron from the same ladle, before and after adding vanadium, but the chemical analysis shows that such could not have been the case. The difference in composition, however, so far as it influences the physical qualities of the iron are all in favor of the iron without vanadium. In addition to the bars for tensile test, chill blocks were cast to show the effect of vanadium on the depth of the chill.

Chemical Composition.

	Without vanadium.	With vanadium.
Graphitic carbon	2.34	2.48
Combined carbon	0.79	0.71
Silicon	1.83	2.21
Manganese	0.43	0.424
Phosphorus	0.508	0.546
Sulphur	0.102	0.071
Vanadium	—	0.056

Physical Tests.

	Without vanadium.	With vanadium.
Tensile strength	34,560	35,600
Depth of chill	no white chill	1/16 inch white chill

Size of chill test block, 4½ inch square by 1½ inch thick.

The difference in machining quality of the two irons was decidedly in favor of the vanadium iron. I need hardly mention that the cast iron treated with vanadium should be at least approximately of the proper composition for the particular class of work to which it is intended.

The usual amount of vanadium added to cast iron is 1/10 per cent. for cupola melted iron, equivalent to about 5 oz. of ferrovanadium for each 100 lb. Some foundries advocate the use of a higher percentage, up to 15 per cent., which is about as much as can be conveniently added in the ladle. As low a percentage as .05 per cent. will produce distinctive effects. Owing to the high melting point of vanadium and the limited reserve heat available in a ladle of iron, it is advisable to use the alloy in a finely crushed condition, or even powdered, when the amount of iron treated is small, and to use an alloy of low melting point. The iron should be tapped out as hot as possible and a ladle used that has just been emptied in order to conserve as much heat as possible. After the bottom of the ladle is covered with a few inches of iron, the finely crushed or powdered ferrovanadium is added by sprinkling on the stream as it flows down the spout to the ladle; in this way advantage is taken of all the available heat and also of the mixing effect of the stream as it strikes the iron in the ladle. After the vanadium is added the contents of the ladle should be well stirred and allowed to stand a few moments in order to insure thorough incorporation and complete reaction.

In the case of the higher grade air furnace iron, with its reserve of available furnace heat, the procedure is very simple; after the charge is melted and 15 to 20 minutes before tapping, the ferrovanadium is added and the bath well stirred or rabbled. The addition of 0.18 per cent. to 0.2 per cent. vanadium is recommended in this case, equivalent to 10 oz. to 11 oz. of 35 per cent. ferrovanadium per 100 lb. of metal.

The American Vanadium Company has lately developed a ferrovanadium containing about 30 per cent. to 35 per cent. vanadium, 10 per cent. to 15 per cent. silicon, 5 per cent. to 10 per cent. manganese and 2 per cent. to 5 per cent. aluminum, which melts and dissolves readily in molten cast iron, and has been giving very satisfactory results. In distinction from the standard low silicon Amervan ferrovanadium we have called this new alloy Masvan.

The American Sheet & Tin Plate Company Starts Gary Plant

No. 1 mill of the Gary plant of the American Sheet & Tin Plate Company was placed in operation June 1. While this was in the nature of a test run, it is expected that practically continuous operation of the plant will follow. As at present completed, blue annealed sheets only can be rolled. Galvanizing pots, however, will be completed in the very near future. The heating, reheating and annealing furnaces are already in service, slabs being obtained from the Gary steel mill. The roughing, finishing and shearing operations of the first mill are also completed and ready for continuous operation. That part of No. 1 power house now under construction for the Indiana Steel Company from which current will be drawn for the sheet mill is rapidly nearing completion. President E. W. Pargny of the American Sheet & Tin Plate Company, and other officials were present at the initial trial of the mill.

Standards for the Various Kinds of Pig Iron

How Specifications Have Been Developed Out of Changes in Steel Works and Malleable Practice

BY FLETCHER COLLINS, PITTSBURGH.

In standard Bessemer pig iron silicon is 1 to 2 per cent, phosphorus 0.10 per cent or under, sulphur 0.05 per cent or under. In the central section (Pittsburgh and the Mahoning and Shenango valleys) it is sold per ton of 2268 lb. if sand cast and 2240 lb. if chill cast. The sand cast iron is often sold broken, and a charge of 25c. is made for breaking, but it is usually sold unbroken. In the East and West it is always sold per ton of 2240 lb. The ton of 2268 lb. is gradually being supplanted by the ton of 2240 lb. in sand cast Bessemer, as well as in all other classes of pig iron. Standard Bessemer pig iron is used chiefly in the acid Bessemer and the acid open hearth steel processes, and the principal condition in its composition differentiating it from other standard irons is that phosphorus must be low—0.10 per cent or under. Since by the acid process the carbon, manganese and silicon in the melt are lowered and a certain amount of iron is also lost, the same amount of phosphorus and sulphur being contained in a smaller amount of iron will show a slightly higher percentage than in the original mix. Therefore the phosphorus and sulphur must necessarily be low in the original mix in order that the finished product may be suitable. Sulphur is generally a harmful element in iron and steel, and the less of it there is in almost all irons the better the resultant product. In the acid open hearth process standard Bessemer pig iron, standard low phosphorous pig iron, and low phosphorous or basic scrap are used, while in the acid Bessemer process the use of low phosphorous pig iron is omitted. In this latter process often Bessemer pig iron is used alone, but a small amount of steel scrap, low phosphorus when available, may be added when the heat is blowing too hot, so as to cool it down. However, low phosphorous scrap is rarely bought especially for use in the acid Bessemer process. In rails and other products of this process the extreme lowness of phosphorus is not required.

In the "baby" Bessemer process where steel castings are produced and where it is necessary to have a casting very low in the element of phosphorus, where also the loss is greater and the initial phosphorus must therefore have a still lower percentage, low phosphorous pig iron is used and Bessemer pig iron is not used. In this process the scrap used consists of gates, necks, etc., usually made in former heats in the same furnace, and which amount to 25 to 50 per cent of the entire heat. Consequently the iron used must be high in silicon in order to give sufficient heat, as there is very little silicon in scrap and the principal source of heat is obtained from the combustion of the silicon.

In the acid open hearth process iron ore which contains a large amount of oxygen in the form of oxides is generally added to the melt and helps to oxidize or burn out the carbon not required in the bath. Indeed, the burning out or lowering of the carbon is the principal action in producing steel in these processes. A certain amount of iron is also absorbed by the slag, and when iron ore is used this iron comes from the ore, instead of from the metallic bath, as it would if iron ore were not used. As can be readily seen, the use of iron ore in the open hearth process is a most valuable one. As the impurities in the bath are largely oxidized by the oxygen of the ore, a certain amount of iron from the ore may be reduced and enter the metallic bath, and by this means the amount of steel produced may even exceed the amount of metal charged.

In the acid Bessemer and baby Bessemer processes the air which is blown through the bath or over the bath oxidizes the carbon without the use of iron ore. When certain of the elements are brought below the percentage desired in the finished steel they are restored by making suitable additions. These additions—ferromanganese, ferrosilicon, spiegeleisen, etc.—also have the distinctly beneficial effect of deoxidizing the steel and thus rendering it free from oxygen blowholes.

Standard Bessemer pig iron is also used in the manufacture of ingot molds. When a mill requiring a low-phosphorous content in its scrap is a user of ingot molds it usually specifies that the molds shall be made of Bessemer pig iron, so that when the molds become useless as molds they can be broken up and used as scrap.

For Low Phosphorus Pig Iron

Silicon 1 per cent to 2 per cent, phosphorus 0.035 per cent or under, sulphur 0.035 per cent or under, in the Central and Western sections, and sulphur and phosphorus 0.03 per cent and under in the eastern Pennsylvania district, while in England the standard analysis for sulphur and phosphorus is 0.035 per cent, with silicon up to 2.25 per cent. One furnace in Ohio sells as standard an iron with phosphorus 0.04 or under. It is always sold per ton of 2240 lb. Standard low-phosphorous pig iron is used in the baby Bessemer and acid open hearth steel processes, which have been briefly discussed under standard Bessemer pig iron. Usually steel casting plants with baby Bessemer converters require a high-silicon low-phosphorous pig iron.

For Basic Pig Iron

Silicon 1 per cent or under, sulphur 0.05 per cent or under, phosphorus 0.50 per cent or under in the Central and Western sections, while in the Southern and Eastern sections the phosphorus is allowed to run as high as 1 per cent. The original standard of phosphorus in standard basic iron was 1 per cent or under, but owing to the lower phosphorous content in Lake Superior non-Bessemer ores furnaces which smelt these ores make a basic iron analyzing as low as 0.20 per cent in phosphorus, and indeed some furnaces invariably guarantee 0.40 per cent or under in their basic iron contracts. Standard basic pig iron is always cast in chills and sold per ton of 2240 lb. It is used in producing steel in the basic open hearth furnace. The principal condition in the analysis is that the silicon be low—1 per cent or under. The reason for the wide use of the basic process is very apparent, as in this process basic pig iron, made from non-Bessemer ore, and for this reason about $1 per ton cheaper than Bessemer iron, and steel scrap of almost any composition are used. The cost of producing basic steel is therefore less than that of acid steel. Whereas carbon, silicon and manganese are readily oxidized and pass into the slag by the action of the heat in the basic as well as the acid process, phosphorus does not diminish in the acid and is gotten rid of in the basic process by the use of limestone. Unless the phosphoric acid which is set free in both processes is combined with some stable base it is reduced and reenters the metalic bath. Limestone, being a very strong base, is therefore used in the basic process and it absorbs the phosphoric acid which has been produced by the action of the heat, and thus renders the steel practically free from the objectionable element, phosphorus. Or the phosphoric acid will be reduced to phosphorus, which will reenter the metallic bath unless some stronger and more stable base is present than the iron. Lime, being a stronger and more stable base than iron, is a necessary addition. The elimination of sulphur is very uncertain. In some cases a small amount may be removed, while in others the percentage may be increased. As silicon which becomes oxidized to silica also combines with the bases in the slag, it will prevent a certain amount of the lime from combining with the phosphorus, and for this reason it will be readily appreciated why its content in the pig iron should be kept down as low as possible, as otherwise an additional amount of lime will have to be charged. A certain amount of sand (silica) is always attached to the surface of a pig cast in sand. The advantage of avoiding this and employing chill (iron) molds is evident. Basic steel is usually much lower in phosphorus than acid steel, the standard specification being 0.05 per cent or under, while

in acid open hearth steel it is somewhat higher, and in Bessemer 0.1 per cent.

The advantage of the basic process and the reason for its wide employment, therefore, is that it enables a cheaper grade of stock—that is, containing greater amounts of impurities—to be employed, in turn eliminating the impurities and producing a fine grade of steel. The desired composition of the steel is effected by making additions similar to those in the acid process. Where an acid and a basic steel have the same composition the former may give slightly higher tensile tests, but the basic ordinarily has less phosphorus than the acid, and as this element is likely to become segregated and is one of the principal causes of brittleness (cold shortness) the reason for the use of the basic material is apparent. For some purposes, however, the acid steel is preferred. Iron ore is added in the basic process as in the acid process, and for similar reasons. There are no basic Bessemer converters in this country. At one time this process was attempted in Pennsylvania and eastern New York, but pig iron analyzing over about 2 per cent phosphorus is necessary, and the difficulties of obtaining this, combined with the increased cost of operating as compared with the acid Bessemer process, showed it to be commercially impracticable. It is, however, employed abroad, chiefly in Germany and to some extent in England. In England the iron used analyzes as follows: silicon, 0.50 per cent; phosphorus, 2.50 per cent; sulphur, up to 0.20 per cent. In Germany the sulphur usually analyzes somewhat lower and the silicon higher. The phosphorus is desired high in order to supply sufficient heat when no carbon or silicon is left. The period when the phosphorus is oxidized is called the "afterblow."

For Malleable Bessemer Pig Iron

Silicon, 0.75 per cent to 1.75 per cent; phosphorus, 0.20 per cent or under; sulphur, 0.50 per cent or under. There is usually a more exact silicon specification in inquiries and purchases of malleable iron, and users generally like manganese 0.60 per cent to 0.80 per cent, and so specify in their inquiries, but some require manganese 0.40 per cent to 0.60 per cent, and occasionally 1 per cent to 1.35 per cent is desired. It is produced in sand cast pigs as well as chill cast, and is sold in tons of 2240 lb. except by a few furnaces in the Shenango and Mahoning valleys, which sell 2268 lb. Sand cast pigs are sometimes sold broken and sometimes unbroken. With regard to the finished malleable casting, it is usually not altogether desirable to have a very high tensile strength, but rather a high transverse strength and particularly a good deflection. This means that a soft ductile metal which adjusts itself to these conditions more readily than any other must be used. The malleable process consists in casting the metal so that practically all the carbon shall be in the combined condition, the fracture being white. The castings are next annealed (heated) at a given temperature, at which the combined carbon is converted into an amorphous uncombined condition, entirely different from the condition of the graphitic carbon of the gray iron casting. In the case of malleable castings the carbon occurs in nearly spherical spots or globules which do not interfere to nearly the same extent with the continuity of the metal as the graphite of the gray iron casting. The reason for the greater strength and better quality of malleable castings over gray iron castings is found in this condition of the carbon. In gray iron castings nearly all of the carbon exists as graphite, which occurs in thin plates, breaking up the continuity of the mass, these plates forming cleavage planes, or planes of weakness, along which the iron is readily broken, as the graphite itself possesses no strength or ductility. Furthermore, a certain amount of the carbon in the malleable casting is removed by oxidation, particularly at or near the surface. As a high percentage of phosphorus would naturally tend to make the casting brittle, which would defeat the whole object of the process, the phosphorus must necessarily be low. On the other hand, Bessemer iron costs about 50c. more than malleable Bessemer, and as the phosphorus is not required as low as 0.10 per cent. to accomplish the desired result the standard shown above has been adopted. The silicon also is an important element in the malleable casting. A certain amount of silicon is necessary to assist in converting the combined carbon to the uncombined or amorphous condition during annealing, but if too much silicon is present some of the carbon will separate out as graphite in the cooling of the casting before annealing takes place, which graphite renders the finished casting more or less brittle. The amorphous carbon of the malleable casting does not have this effect, thus constituting the difference between ordinary gray iron and malleable castings as already explained. So in malleable castings the silicon is usually kept down to 0.50 per cent. or 0.85 per cent. depending largely upon their shape and thickness. Malleable Bessemer pig iron has been often called coke malleable, and simply malleable iron, but the accepted term to-day is malleable Bessemer pig iron.

Iron and Steel Exports and Imports

April Makes a Fresh Record in Exports

The April report of the Bureau of Statistics of the Department of Commerce and Labor shows a further important increase in our exports of iron and steel as compared with the figures of the March report, which were the largest in our history up to that time. Our imports were not so large as in the previous month. The total value of the exports of iron and steel and manufactures thereof, not including iron ore, was $24,917,056 in April, against $22,591,848 in March, while the value of similar imports was $2,439,885 in April, against $2,951,710 in March.

The exports of commodities for which quantities are given totaled 227,832 gross tons in April, against 215,667 tons in March and 117,410 tons in April, 1910. The details of the exports of such commodities for April and for ten months of the fiscal year ended with April are as follows, compared with corresponding periods of the previous year:

Exports of Iron and Steel.

Commodities.	April 1911. Gross tons.	April 1910. Gross tons.	Ten months ended April 1911. Gross tons.	Ten months ended April 1910. Gross tons.
Pig iron	12,188	11,757	138,790	63,103
Scrap	9,673	1,764	43,032	10,821
Bar iron	1,521	1,749	15,219	12,587
Wire rods	1,651	4,562	14,805	20,608
Steel bars	9,239	7,227	100,104	72,861
Billets, ingots and blooms	27,417	168	146,198	49,133
Steel rails	54,182	19,732	322,257	308,670
Iron sheets and plates	9,952	8,905	84,157	79,059
Steel sheets and plates	23,480	14,101	163,672	115,653
Tin and terne plates	6,125	1,339	22,487	9,457
Structural iron and steel	19,426	15,441	137,881	88,722
Barb wire	6,782	7,128	67,484	60,504
All other wire	14,687	8,032	89,994	64,776
Wire nails	6,288	3,895	43,637	29,097
Cut nails	695	535	8,374	7,418
All other nails, including tacks	1,764	433	10,149	6,480
Pipe and fittings	22,762	10,642	149,507	137,477
Totals	227,832	117,410	1,267,747	1,136,426

The imports of commodities for which quantities are given totaled 22,390 gross tons in April, as compared with 23,533 tons in March and 47,697 tons in April, 1910. The details of such imports for April and for ten months of the fiscal year ended with April, as compared with the corresponding periods of the previous year, are as follows:

Imports of Iron and Steel.

Commodities.	April 1911. Gross tons.	April 1910. Gross tons.	Ten months ended April 1911. Gross tons.	Ten months ended April 1910. Gross tons.
Pig iron	15,730	24,034	174,822	202,201
Scrap	1,591	4,255	21,595	113,117
Bar iron	1,236	4,967	24,650	25,658
Billets, bars and steel forms, n.e.s.	1,649	5,308	34,163	30,912
Sheets and plates	215	1,422	3,257	3,964
Tin and terne plates	547	5,619	38,675	56,466
Wire rods	1,422	2,092	15,400	11,866
Totals	22,390	47,697	312,562	446,184

The imports of iron ore in April were 133,900 gross tons, against 134,785 tons in March and 206,135 tons in the month of April, 1910. The total importations of iron ore for ten months of the fiscal year ended with April were 1,797,870 gross tons, against 1,947,428 tons in the corresponding period of 1910. Of the April imports of iron ore 80,995 tons came from Cuba, 28,444 tons from Sweden, 12,430 tons from Newfoundland, 11,973 tons from Spain and 58 tons from Canada and other countries.

The total value of the exports of iron and steel and manufactures thereof, not including ore, for ten months of the fiscal year ended with April was $189,798,647, against $144,971,940 in the similar period of 1910.

The total value of the imports of iron and steel and manufactures thereof, exclusive of ore, for ten months of the fiscal year ended with April was $28,689,754, against $31,947,937 in the similar period of 1910.

Experience with Permanent Molds*

Characteristics of the Castings—Working with Untrained Men

BY EDGAR A. CUSTER.

To use permanent molds successfully one must abandon all the preconceived ideas as to the behavior of the molten metal and must forget all the theories and the effects that influence and affect molding in sand. The casting the permanent mold produces is an entirely different metal from the same casting when made in sand, even when made from the same iron. The difference is not chemical, but is purely physical. The permanent mold castings differ from the sand castings not only in their physical structure but in their characteristics. A soft, open pig high in graphite carbon becomes a close-grained iron showing no traces of the graphite flakes, but having the same amount of free carbon as existed in the original pig. It is capable of being magnetized and of permanently retaining the magnetism; it can be tempered and hardened precisely the same as a bar of tool steel and when tempered will make a cutting tool equal to the best non-alloy steel. This latter fact is true irrespective as to whether the original pig was high or low in silicon.

There are no spongy spots, and the castings are free from shrinkage strains. The castings can be taken from the mold at a bright red heat and plunged into cold water until cold without showing sign of cracks. High shrinkage does not begin in a permanent mold casting until a very low temperature is reached, 1200 deg. to 1400 deg. F. being the point at which the casting must be removed to prevent shrinkage cracking the undercut parts.

The basis of the permanent mold system is the fact that molten iron does not chill—using the word chill to express white, hard crystals—until after the iron is set, and that this chilling does not begin until after the iron has shrunk to the bulk it occupied in the molten state. Molten iron when poured into a mold first swells until the point at which it begins to set is reached, then the bulk remains at that point for a short space of time while the cooling progresses, and then it shrinks until cold. The interval between the point at which it sets and the point at which chilling begins is long enough to enable the workman to remove the casting from the mold, and in that time it will be sufficiently hard to be handled without fear of distortion or breakage.

The main object of the process is to set the iron as quickly as possible and, when this is done, to remove the casting instantly from the mold. To accomplish instant setting the molds are made of quite large bulk so that they will have large heat capacity. A further object in making the molds of such large bulk is to prevent distortion from the heat action.

Since continuous operation of permanent molds entails continuous melting of iron, this brings us to the foundry conditions that are essential to economical production. These conditions may be classified as follows:

Continuous melting, selection of proper iron, labor-saving appliances, general remarks.

Continuous Melting

It is evident that in order to operate the molds continuously some form of continuous melting must be practiced, and it is also evident that the iron must be melted in comparatively small quantities per hour—else the tonnage melted per day would require a very large number of molds. Small quantities of iron per hour means small cupolas, so the problem becomes one of melting iron continuously and economically in cupolas that will melt 1 to 5 tons per hour. It has been found entirely feasible to operate a cupola 21 in. in diameter inside of lining for 10 hr. a day at an average melting rate of 8 lb. iron to 1 lb. of fuel and to continue this performance from day to day. It is feasible to run the same cupola for 48 hr., as witnessed by the run noted below, and to have an exceptionally high melting ratio.

We solved the problem of the continuous operation of this small cupola by using a slight excess of limestone and a change in the fuel charge designed to keep the bed hot. This change consisted of substituting large lump anthracite coal for a portion of the coke on each charge and jumping the weights of the iron charges from 250 to 500 lb. The larger charge, of course, carried with it a corresponding increase in fuel which, due to the coal used, retains its life until well below the melting line, thus preserving the life of the bed and keeping the melting zone in the proper place. This change enabled us to keep a continuous stream during a full working day. This was kept up for several weeks until we found by several slight changes in ratios we could drop bottom in the evening with the cupola in such good condition that very little work was required to put it in shape for the next day's run, the general principle being to keep the charges large in the quantity of iron and the draft low in pressure, making sure that the tuyeres are of sufficient area to furnish a surplus of air. When the blast was first turned into the cupola the pressure was kept at 14 ounces of water until the iron began to melt. It was then lowered to 6 ounces and kept there throughout the heat. The flux used was limestone, 15 lb. being charged to each 500 lb. of iron. With this plan no difficulty was experienced in running 10 hr. each day. As an instance of what can be done in the line of continuous melting the following run made by Edgar A. Custer, Jr., at the Tacony Iron Works, is quoted:

"The run proper began at 7 a.m. Monday, August 15, although at 5 a.m. the sand bottom was put in and the customary small quantity of wood lighted. The bed consisted of 140 lb. of coke and 70 lb. of coal. This brought the level about 12 in. above the top tuyeres. The first charge of iron was 300 lb. No. 2 plain pig and 300 lb. stove-plate scrap and foundry gates. The succeeding charges were 35 lb. coke, 15 lb. coal and 500 lb. iron (250 lb. pig and 250 lb. scrap). To this were added 15 lb. limestone. The pressure was obtained from a small rotary fan driven by a motor and regulated by the usual blast gates.

"At 7 a.m. the cupola was tapped out and on the twentieth charge it was found that the iron was too hot for our use. The iron charge was then raised to 600 lb., the fuel remaining at 50 lb. At 6 p.m. the night gang came on, who were relieved at 7 a.m. August 15, at which time there had been used 64 charges, totalling 36,500 lb., or about 1520 lb. per hour at the ratio of 10 lb. of iron to 1 lb. of fuel.

"After 47½ hr. continuous running it became necessary to drain the cupola and drop bottom in order to repair the lining. This consumed 7½ hr., and the cupola was started at once. The second run was almost identical with the first, except the melting was rather slow and sluggish for an hour—probably due to the repair. This second run ended at 2 p.m. Friday August 19, a total of 49½ hr. of continuous running, during which 73,000 lb. of iron were melted with a ratio of 11 lb. of iron to 1 lb. of fuel.

"As a grand total this cupola was operated for 97 hr. out of 103 and melted a total of 144,800 lb., or about 72 tons at a rate of approximately ¾ ton per hour at a fuel ratio of 11 to 1.

"On this run a battery of eight permanent molds was used, and these molds were poured at the rate of one round each 5 min. without showing undue heating. Since then we have run a cupola 42 in. inside lining for 60 hr. at the rate of 7 tons per hour with a melting ratio of 10 to 1. In this case the iron was much higher in silicon and required more fuel to melt."

Selection of Proper Iron

The permanent mold is not a cure-all for foundry ills, and the same care must be exercised in selecting the iron for each line of castings as is the case in any other foundry proposition. The main elements that must be avoided in permanent mold work are manganese and sulphur. High manganese has the effect of making permanent mold castings hard and brittle, in this respect being radically different from its effect in sand castings. High sulphur tends not only to make the castings hard and brittle, but has a decided tendency to form holes in those portions of the

*From a paper read before the American Foundrymen's Association, Pittsburgh, May 24.

castings that will not permit of the employment of risers. The influence of silicon is very slight when its percentage ranged from 2 to 3 per cent.

The ideal iron for permanent mold work would be as follows: Silicon, 0.0225; sulphur, 0.0004 or under; manganese, 0.0040 or under; phosphorus, 0.0050; total carbon, 0.04.

Labor Saving Appliances

Every effort should be directed toward making the work as easy as possible. The iron should be brought to the molds on easy running trolleys and in ladles so balanced as to require the minimum amount of effort to pour. The molds should be so placed as to allow pouring direct from the trolleys and provision made to protect the men from splashing iron. Conveyors should run beneath the molds to remove the hot castings rapidly from the room. In addition to this each man should be required to do but one operation for each casting made. If there are five distinct operations necessary from the pouring to the closing of the mold, five men should be provided. Under this system, with a battery of ten molds, the time to make a casting is the time necessary for the pourer to fill the mold and move on to the next. With a battery of castings ranging in weight from 10 to 25 lb. this time is about 25 sec. As an evidence of what can be done with a gang well trained and equipped with labor-saving devices, I present a record of one of our batteries where the castings are larger than those usually poured, being principally T's and Y's and averaging 21 lb. each. One gang was timed and counted with the following result:

	Castings produced.	Castings lost.
9 to 10 a. m.....	123	2
10 to 11 a. m.....	119	1
11 a. m. to 12 m.....	146	1

In this work the cores were pulled with air-lifts, and the iron was supplied the gang in ladles hung on trolleys. In some cases where the character of the casting allows, the mold can be designed to allow very rapid work. In a plow-point mold 300 castings have been made in 2 hr. In a mold containing two 2-in. flange unions, over 500 castings have been made in 2 hr.

As the use of permanent molds contemplates the employment of unskilled labor due allowance must be made for the grade of intelligence they possess, and they should be surrounded with every safeguard possible. They should be required to wear substantial foundry shoes and gloves, especially shoes, as the process is carried out on cement floors that tend to scatter carelessly splashed iron. Too much emphasis cannot be laid on subordinating the personal equation by the use of power where possible; every man movement eliminated means a decrease of the probability of bad work. Where but one line of work is made this latter feature becomes a necessity.

General Remarks

The only place where the mold disintegrates is in the runners and gates. The matrix of the mold, never in our experience, shows any sign of wear or crumbling. After we have made from 7000 to 10,000 castings we generally renew the gates by inserting new blocks. The cost of this repair is generally 10 per cent. of the original cost of the mold. We have made 21,000 castings in a single mold, each casting weighing 10 lb., and the matrix today shows the original tool marks. The life of the mold does not depend so much on the number of castings that are poured into it as upon the number of times it is allowed to become cold. Working a mold continuously, day and night, will quadruple the number of castings that may be made before repairs are required.

Each mold is primarily designed to produce 1000 lb. of castings per day, and in our room containing 37 molds there were produced 18 tons of good castings in 10 hr. The floor space required by these molds is 60 x 26 ft., and to produce the same tonnage of the castings in sand a floor space of 450 x 105 ft. would be required. Also to produce the same tonnage in sand the services of 54 expert foundrymen would have been required whose pay would average $3.50 to $4.50 each per day.

In April, 1910, a statement was made that this process was not dependent upon skilled labor and that ordinary laborers could be employed upon it without previous experience and get economical results. In order to test this out, on Friday, April 21, we hired 18 men from the street; 16 of them could not speak English and but one of them had ever been in a foundry before. On Friday and Saturday we simply pushed these men around and endeavored to teach them not to be afraid of the molten iron. To the 18 men we added 3 of our more experienced workmen, and on Monday these 21 men were turned over to an outside concern who then assumed entire charge of this portion of the plant. They took account of the number of castings made, the hours of the men and the costs that entered into the production of these castings. There were 37 molds. The average molding cost alone of these castings when made in sand was 6 cents each, figured on a piece work basis. The results of this test follows:

Casting in Permanent Molds with Untrained Workmen.

	No. hr's work.	No. castings made.	Cost per piece.
Monday	7	896	$0.023
Tuesday	10	1,419	.021
Wednesday	10	1,767	.0169
Thursday	10	1,972	.0152
Friday	10	2,174	.0138

The cost of these castings when made in sand, for molders' labor alone, was $9.02 per ton. The molding cost the last day of this test was $2.14 per ton. To the molding cost of these castings when made in sand must be added tumbling and cleaning and the cost of sand.

There is one more feature that has never been published, and that is the saving in gates that can be accomplished by continuous running. In all cases we find our iron too hot when the cupola is properly run. When this condition arrives the gates are broken from the castings while red hot and are placed in the empty ladles. The iron is then tapped on these gates and the resultant melt is about the right pouring temperature. On the last day of the run above quoted there were made 16½ tons of good castings, and there were remaining 125 lb. of gates.

In referring to the $8,000,000 increase in value of American exports to Brazil for 1910 over 1909, Vice-Consul General J. J. Slechta, Rio de Janeiro, analyzes metal products as follows: Iron and steel for use in manufacturing, a slight increase; arms and ammunition, $460,000; automobiles, $70,000; railway cars, slight gain from the United States, though a large general increase; copper wire and other copper manufactures $100,000; cutlery, $110,000; iron wire, $190,000; nails, screws and heavy construction material in iron and steel, a small increase; electrical machinery and apparatus, $460,000; locomotives, slight gain; industrial machinery, $100,000; agricultural machinery, $120,000.

Present indications point to this year's cotton crop as the largest the country ever has produced, according to government experts. Based on the statistics of condition as given out by the crop reporting board of the Department of Agriculture and on the averages for the previous ten years, the crop will be greater by about $2,500,000 bales than the average, and larger by nearly 400,000 bales than the biggest crop the country ever raised, that of 1904. Providing conditions as favorable as those which have prevailed in the last ten years continue during this season, there should be harvested this year more than 14,000,000 bales.

The Precision Instrument Company, Detroit, Mich., sells its combination recorders through the following agencies, each having its special territory: James H. Herron, Engineers' Building, Cleveland, Ohio; Birger F. Burman, Ferguson Building, Pittsburgh, Pa.; Braun Corporation, 363-371 New High street, Los Angeles, Cal.; Braun-Knecht-Heimen Company, 576-584 Mission street, San Francisco, Cal.; Catton Neill & Co., Honolulu, Hawaiian Islands; William Kemp, 507 Oriel Building, St. Louis, Mo.; Charles S. Buell, 1641 Manadnock Building, Chicago, Ill.; B. L. Ames, 205 Equity Building, Boston, Mass.; R. T. Stafford, 611 White Building, Buffalo, N. Y.

Reports that the Ellwood City Forge Company, Ellwood City, Pa., had increased its capital stock from $25,000 to $100,000 and would build large additions to its plant are untrue. It has not increased its capital stock, but at present is installing a double carriage, 36-in. Pond lathe, and will also place some other new machinery in its present building.

The Lockhart Iron & Steel Company, Pittsburgh, has increased its capital stock from $250,000 to $1,000,000.

The Steel Corporation Investigation

Some of the Testimony of Chairman E. H. Gary

The most notable contribution to public literature on the subject of the economics of industry and the relation of great combinations to interstate commerce and to the federal government that has been presented in many days was contained in the testimony of E. H. Gary, chairman of the United States Steel Corporation. For two days, Thursday and Friday of last week, he was before the committee, and in a full, free and frank manner met all the questions that were propounded to him by Chairman Stanley and the various members of the investigating committee.

The scope of Judge Gary's testimony, which has not yet been completed, but will be continued this week, covered not only the organization of the Steel Corporation, but many detailed facts connected with the various subsidiary corporations which were merged into the United States Steel Corporation, down to and including the taking over of the Tennessee Coal, Iron & Railroad Company. The activities of the Steel Corporation in all its branches, including the assembling of materials and the manufacture of products, were discussed with all the thoroughness that was called for by the queries propounded to the witness.

Notable Features of Judge Gary's Testimony

Perhaps the most notable features of Judge Gary's testimony were his plain declaration that the Sherman anti-trust law is unsuited to modern business conditions, has no effect and will not prevent great combinations of capital; his announcement that the federal government should take upon itself the duty of controlling prices so far as relates to products which enter into interstate commerce, and his full and free statement regarding the aims and purposes of the absorbing by the Steel Corporation of the Tennessee Company, which, he declared, was for the avowed purpose of avoiding and preventing a serious financial panic.

With reference to the relation of the Steel Corporation to the interstate traffic in iron and steel products, and to the federal government in the operation of the Sherman anti-trust law and other laws which bear upon interstate business and combinations of capital, Judge Gary made the statement to the committee that there was not a fact connected with the workings of his corporation which would not be presented to Congress if asked for. He declared that the corporation has nothing to conceal and desires "to stand or fall squarely upon its record." In connection with this statement he informed that committee that for several years his corporation in all its workings has been under the closest scrutiny and inspection by the Bureau of Corporations of the United States government. He asserted that thousands of dollars have been expended by the corporation in preparing facts and evidence for the information of the bureau, and that any testimony which the corporation's officials could give to Congress bearing upon the workings of the organization would be freely and fully given if asked for by the Congressional investigating committee.

Having covered the greater part of one day's hearing with a review of the organization of the Steel Corporation, together with a brief history of each of the subsidiary corporations which were merged in it, Judge Gary next proceeded to give the committee the details of the present workings of the corporation and his opinion regarding the relation of that institution to the assembling of materials, the producing of iron and steel articles and the distribution through interstate commerce of these commodities. In connection with this part of his testimony there arose queries from the committee as to the efficiency of the Sherman anti-trust law in its bearing upon such corporations as the United States Steel Corporation. In this connection the significant part of his statement regarding the Sherman anti-trust law was as follows:

> The Sherman act does not now, and never will, prevent the organization of great combinations of capital. It is archaic and unable to deal with modern situations. I believe that we must come to enforced publicity and governmental control of corporations, even to the extent of having federal authorities fix prices.

Steel Rail Prices

In connection with the questions propounded by the members of the committee regarding steel rail prices and prices of metal products generally, including export prices of rails, etc., Judge Gary emphasized his statement regarding the course of prices by declaring that there is at present a general upward tendency in the prices of steel rails. He asserted that the cost of producing steel rails has greatly increased during the last ten years, as "wages have increased, specifications are different and heavy equipment and increased speed of the railroads demand bigger and better rails." He made this statement in connection with the question asked by the committee whether the present prices can be maintained in the face of any limitations imposed by the Sherman law, or through the methods employed by corporations engaged in the steel industry. He asserted that there is such diversity of interest in the steel business that some way must be devised to allow manufacturers to protect themselves against destructive competition that will drive manufacturers out of business, or "else we will all be in chaos." In effect, the statement by Judge Gary was that the time has come when in the interest of the consumers as well as the producers new policies must take the place of destructive competition which demoralizes markets and produces loss and injury to the trade.

There was considerable conflict of opinion shown in the statements of Judge Gary before the committee, compared with the statements made a week ago by John W. Gates, with respect to the absorption of the Tennessee Coal, Iron & Railroad Company by the Steel Corporation. The essence of Mr. Gate's testimony was that the sale of the stock of the Tennessee Company to the Steel Corporation was a forced sale at a price that was below what the stock should have brought, considering alleged relative values of that company's stock and the securities of the Steel Corporation which were transferred in payment therefor. The chief feature of Judge Gary's testimony was a detailed account of precisely what took place, according to his understanding of the matter, in bringing about the absorption of the Tennessee Company. He declared that it was for the purpose of preventing a panic and to save the firm of Moore & Schley, of New York, from possible failure, by reason of the enormous amount of Tennessee Company stock which the banking firms held, the loans on which had been called. In his opinion the sale of the Tennessee Company was not a forced sale, in the sense of a sale at a depreciated price of the stock, but rather that the price paid was even more than the stock was worth, the price being paid on account of the desire on the part of heavy financial interests in New York to prevent the failure of Moore & Schley with attendant financial demoralization and panic.

The Corporation's Advantages

Other interesting features of Judge Gary's testimony included the relation of the Steel Corporation to the fields of ore production and the shipment of ore from those fields to the centers of the steel industry. Many details were brought out regarding the relation of the Steel Corporation to transportation in those fields, and out of the general industrial centers of materials and finished products, and the part which the corporation has in control of certain transportation lines, terminal facilities, etc., was discussed in connection with the question as to the advantages which the corporation enjoys over its competitors in the matter of the control of transportation facilities as well as in the fields of general production.

Judge Gary admitted that in time of stress and falling prices, or price wars, the corporation would have an advantage over its competitors by reason of its control of transportation facilities. In regard to the general advantages of the corporation in matters of production, Judge Gary admitted that the corporation has such advantages, which he said were comprised in "greater capital, greater talent for organization, of large funds in a central bank

and the like, and the subsidiary companies by virtue of this organization do not need half as much money as any one of them would need to operate independently. These companies could not do half of the export business they do to-day if they were segregated. The export situation is one of the dominating causes of the organization of the United States Steel Corporation."

In answer to the question submitted by the committee as to sales of steel rails abroad at lower prices than in the domestic market, Judge Gary said that, to his knowledge, no such sales of from $2 to $4 a ton less than the domestic price had been made. He said, however, that the Steel Corporation does not control the price of rails and that they cannot be sold for less than $28 a ton. He asserted that one reason why steel rails might be sold abroad for as low as $26 a ton as against the domestic price of $28 was in pursuance of the policy of "dumping," which he stated is resorted to by the industries of all countries. This, he said, would result in steel rails or like products being sold abroad at cost "so that the steel manufacturer would be able to keep his mills running, reducing the cost of production and keeping together a compact organization," which could not be done if surplus stocks were not disposed of.

As limitations of space this week prevent the publication of a verbatim report of Judge Gary's testimony, we give the following condensation of his history of the events which brought about the absorption of the Tennessee Company by the Steel Corporation:

The Purchase of the Tennessee Company

Judge Gary declared that the purchase of the Tennessee Coal, Iron & Railroad Company was made at the solicitation of Grant B. Schley, of the banking and brokerage firm of Moore & Schley, and his friends to save that firm from going under, and to prevent the financial calamity that would have followed its downfall. The United States Steel Corporation, after repeated urgings, finally stepped in and paid 100 for a stock which the financial managers of the corporation did not consider at the time to be worth more than 65. The difference of 35 points represented what the United States Steel Corporation felt was its duty to pay to avert the threatening panic. In all it turned about $30,000,000 over to the firm of Moore & Schley, and enabled it to weather the storm.

In October, 1907, Judge Gary said, J. P. Morgan asked him to call at his office and told him that Grant B. Schley was very much in need of money or securities. Mr. Gary conferred with Mr. Schley and the United States Steel Corporation finally accommodated him by loaning him $1,200,000 of the Steel Corporation's second mortgage bonds, and taking from him as collateral for the loan $2,000,000 par value of Tennessee Company stock. Mr. Schley also signed an agreement that if the Steel Corporation bonds were not returned by April 23, 1908, ownership of the stock should pass to the United States Steel Corporation. "That was done," said Judge Gary, "entirely as an accommodation to Mr. Schley at his own request, because he said that it was necessary to protect him from financial trouble. That was taking the Tennessee stock on the basis of 60 cents."

Conference at J. P. Morgan's

The next event that led up to the absorption of the Tennessee Company occurred Nov. 2 of the same year, during the panic.

"Bankers of the city of New York," said Judge Gary, "were in session almost night and day. There is no doubt that we were in the throes of a panic that might lead to most disastrous results, including the suspension of a large number of banks and the failure of many people. There could be no doubt that the country was in grave danger of one of the worst financial panics it had ever seen."

This was the situation when Judge Gary was requested by Mr. Morgan to call at his library. He found Lewis Cass Ledyard and Grant B. Schley there. Mr. Ledyard said that the firm of Moore & Schley was in very great financial distress; that it was largely indebted to Mr. Payne, his client, and had a great many securities deposited as collateral for loans in many banks. These banks had called upon Moore & Schley to take up the loans, because the Tennessee stock was not readily salable. Mr. Ledyard said, so Judge Gary testified, that there was apparently no way of preventing the failure of Moore & Schley unless the Steel Corporation purchased the Tennessee stock. J. P. Morgan, according to Judge Gary, then made this statement to him:

"I don't know whether the United States Steel Corporation can afford to buy this stock, but I will say if it does not or unless some one else furnishes relief no one can say what the result will be in financial circles in this country. The situation is critical. If you can see your way clear to buy no doubt it will help the situation."

"I said to Mr. Morgan," testified Judge Gary, "that I would not think of considering the purchase before going to Washington and taking the matter up with the President and the Department of Justice. He said: 'Why, have they any right to say whether you shall buy or not?' I said. 'No; but there is a financial crisis, and you say that the object is to allay the storm, but if representatives of the Government should find out that we were about to purchase this company and enjoin the transaction on the ground that it would increase our holdings and tend to a monopoly you can see that we would have made the financial conditions very much worse.' "

Mr. Morgan agreed with Judge Gary in this view, and the latter then telephoned for Mr. Frick and asked him to come immediately to the Morgan library. Judge Gary asked Mr. Frick to get ready for the trip to Washington and Mr. Frick replied that the question to consider first was whether the Steel Corporation would purchase the Tennessee Company under any circumstances.

"I had said," testified Judge Gary, "that the stock was not worth more than 65 and Mr. Frick expressed the same opinion. He was very much opposed to the transaction, and it was not until Mr. Morgan personally had explained to him the critical situation confronting the financial world that he gave any encouragement to the suggestion."

Offers of a Large Loan Not Considered Sufficient by the Firm Involved

Judge Gary called a meeting of the finance committee of the Steel Corporation in Mr. Morgan's library and it was finally decided to offer a loan of $6,000,000 to Moore & Schley, taking the Tennessee stock as a collateral. If that was not acceptable, the Steel Corporation was to offer to buy on a basis of 90 for the stock, payment to be made in bonds of the Steel Corporation. Judge Gary conferred with Mr. Ledyard and the latter replied that the loan of $6,000,000 would not do. Mr. Ledyard informed him that Oliver H. Payne and one or two others had offered to lend Mr. Schley $3,000,000, but that this, with the $6,000,000, making $9,000,000 in all, would not carry Moore & Schley through.

The possibility of making a loan to Moore & Schley having fallen through, Judge Gary then offered to purchase the stock on a basis of 90, but Ledyard came back to the Morgan library and said that a sale even at 90 would not let Schley out. Another meeting of the finance committee of the Steel Corporation was then called and the figure was raised to 100.

"Mr. Morgan," continued the witness, "did not participate in any respect in the sale or attempt to use his influence. I do not hold a brief for Mr. Morgan, but I make that statement in reply to some of the sensational statements that are apparently based on misrepresentation."

Judge Gary explained that the corporation officers decided to pay for this stock in bonds, because any attempt by them to withdraw $25,000,000 in cash from the banks of the country or to transfer such an amount from one bank to another would have greatly disturbed banking conditions.

"The United States Steel Corporation," he said, "had about $75,000,000 in cash in the different banks of the country at the time of the panic. If we had been disposed to take advantage of the financial conditions we could have bought bonds of all descriptions at low prices, but certainly there was no disposition on the part of the United States Steel Corporation or any one connected with it to turn the situation to his financial advantage."

Judge Gary testified that the $30,000,000 or more required by Moore & Schley probably did not all represent obligations of the firm. The Tennessee stock was owned by a syndicate and had merely been turned over to Grant B. Schley as one of the managers. Members of the committee seemed to be surprised that this large sum of money should be needed by Moore & Schley when the

Tennessee syndicate was composed of men of large wealth. Judge Gary intimated that some members of the syndicate may have insisted that Mr. Schley live up to the syndicate agreement and refused him permission to sell his stock unless all the syndicate holdings were disposed of at the same time.

Referring to the testimony given by John W. Gates, in which he said that he regarded the taking over of the Tennessee Company as a forced sale, Mr. Gary said:

"Mr. Gates says in his testimony that the board of directors passed a resolution that the minority stockholders should have the right to turn in their stock at the same price. I have no recollection of that. If it is true, it would look as though they were rather forcing us to buy than that we were trying to make them sell.

"As a matter of fact, the original memorandum provided that we should take the minority stock at the same price as the other. This was consummated before Mr. Gates returned from Europe. I think he is mistaken in his memory of the facts."

President Roosevelt Called On

Judge Gary then told of his trip to Washington on board a special train with Mr. Frick. They had an appointment with President Roosevelt at 10 o'clock in the morning, but conditions were so critical in New York City that they called at the Executive offices at 9 o'clock, and asked if the President would not make an exception to his rule and see them earlier. Mr. Loeb went over to the White House, where the President was eating breakfast, and returned with Mr. Roosevelt. Judge Gary and Mr. Frick presented the situation to Mr. Roosevelt, and he said that he would like to consult with the Department of Justice. Attorney-General Bonaparte was out of the city, and Mr. Roosevelt summoned Secretary of State Root. The President asked Mr. Root's opinion in regard to the taking over of the Tennessee Company, and Judge Gary said that the then Secretary of State concurred in their views as to its propriety.

Four days after the interview with President Roosevelt Judge Gary recorded what had happened at that interview in a letter to Secretary of State Root. His record of the interview was substantially the same as that which President Roosevelt made public, to the effect that the Steel Corporation had been urged to purchase the Tennessee stock as a means of avoiding a failure, that the corporation did not want the Tennessee property, and that it would be of little benefit to the corporation but that they felt obligated to do everything possible to avert a panic.

"I understood the President to say," said Judge Gary, "that while he would not and could not legally make any binding promise or agreement, he did not hesitate to say from all the circumstances as presented he certainly would not advise against the proposed purchase."

Secretary Root replied in a letter acknowledging the accuracy of Judge Gary's recollection of the interview, and the Gary letter was forwarded by Mr. Root to President Roosevelt, who in turn sent it to the Department of Justice to be recorded.

Judge Gary recalled that President Roosevelt said at that interview that he had no right to tell them whether they could buy the Tennessee stock, and that, as he understood it, Judge Gary and Mr. Frick merely wanted to know what the disposition of the President and of the Department of Justice would be. Judge Gary added that President Roosevelt seemed particularly pleased by the assurance they gave him that the percentage of the Steel Corporation's control over the trade in this country had materially decreased since it was organized. President Roosevelt remarked to them that he did not think that anybody would criticise him for saying that he did not feel like objecting to the purchase.

The Correspondence Made Public

Judge Gary then read to the committee the following letters:

New York, November 7, 1907.

My Dear Mr. Secretary: At the recent interview at the White House between the President and yourself and Mr. Frick and myself, I stated in substance that our corporation had the opportunity of acquiring more than half the capital stock of the Tennessee Coal & Iron Company at a price somewhat in excess of what we believed to be its real value, and that it had been represented that if the purchase should be made it would be a great benefit to financial conditions, and save from failure an important business concern, and that, under the circumstances, Mr. Frick and I had decided to favor the purchase, unless the President objected, and I further stated that the total production capacity of our companies would not be materially increased by the purchase of the Tennessee Coal & Iron Company, and that the purchase would probably not bring it to more than 60 per cent. of the total steel production in this country, which was about the capacity of our companies at the organization of the Steel Corporation; that our position was opposed to securing a monopoly in our lines or materially increasing our capacity. I understood the President to say that, while he could not make any binding promises, he did not hesitate to say that, from all the circumstances as presented, he would not advise against the purchase. Very truly,

E. H. GARY.

To the Hon. Elihu Root, Secretary of State.

Washington, D. C., November 11, 1907.

Dear Mr. Gary: I have your letter of November 7, which fully agrees with my recollection of the interview to which you refer, in which you stated to the President the circumstances under which the United States Steel Company had been asked to relieve the financial situation by the purchase of the stock of the Tennessee Coal & Iron Company. I have sent a copy of your letter with this answer to the President with the recommendation that it be transmitted to the Department of Justice for filing there.

Very sincerely,
ELIHU ROOT.

Washington, D. C., November 20, 1907.

Dear Mr. Gary: I enclose a copy of the letter which I have sent to the President, enclosing a copy of your letter of November 7 and a copy of the President's answer. You now have a complete record of what you will be able to find on the files of the Department of Justice, should occasion arise.

Very sincerely,
ELIHU ROOT.

Inclosed were the following copies, first from Mr. Root to the President, dated November 11, 1907, and President Roosevelt's reply:

Dear Mr. President: I transmit herewith a copy of a letter from Mr. Gary, dated November 7, 1907, and received by me on the following day. You will see that it relates to an interview which Mr. Gary had with you last week regarding the purchase of the stock of the Tennessee Coal & Iron Company by the United States Steel Corporation, and I recommend that these papers be sent to the Department of Justice and placed upon the files of that department.

Yours sincerely,
ELIHU ROOT.

November 19, 1907.

Dear Mr. Secretary: I am in receipt of your letter of the 11th inst., with inclosures, and have forwarded them to the attorney-general to be placed on the files of the Department of Justice, together with a copy of this letter. Mr. Gary states the facts as I remember them.

Yours sincerely,
T. ROOSEVELT.

"When you went to the President, did it amount to your obtaining an opinion as to whether the deal was a violation of the law?" asked Mr. Littleton.

"We did reach the conclusion," admitted Judge Gary, "that if we acquired the securities and afterward there should be a proceeding by the Government against us to prevent confirmation of the deal, it would amount to a great outrage."

"And if such proceeding were taken, the company thought it would have a strong defence, did it?" asked Mr. Littleton.

"Well, I should think we would have if Mr. Martin Littleton were defending the case," said Judge Gary.

Judge Gary said he regretted that chairman Stanley of the committee believes "that Mr. Frick and I misrepresented the facts to President Roosevelt," and he wanted to satisfy the committee by facts and figures that there was no misrepresentation.

"I believe every one connected with the United States Steel Corporation cares more for his conduct, reputation, and character than he does for the making or losing of a few dollars," said Judge Gary.

More of the Testimony of John W. Gates

Limitations of space prevented the presentation last week of considerable of the testimony of John W. Gates before the Stanley committee of investigation May 27. Following are some further interesting extracts:

Mr. Beall: Some time ago you said there was a fear that Mr. Carnegie would demoralize the railroad business and the tube works just as he had done the steel business, as I understood it?

Mr. Gates: That was Mr. Morgan's statement.

Mr. Beall: In what way had he demoralized the steel business prior to this consolidation?

Mr. Gates; Well, in those days we used to have a few agreements. The boys would make them and Andy would kick them over.

Mr. Beall: Was Mr. Carnegie among those inclined to break those gentlemen's agreements?

Mr. Gates: I do not know anything about those gentlemen's agreements, but I know that if Frick and I would agree to one thing in the forenoon, as between our two companies, he might tell me in the afternoon that Carnegie would not stand for it. In other words, no one in the Carnegie Steel Company controlled Mr. Carnegie, but he controlled every other man in the corporation.

Mr. Beall: All these agreements had for their general object the regulation of prices, usually, did they not?

Mr. Gates: Well, I do not know that you could say that.

Mr. Beall: Did the agreement attempt to control the amount of the output of each mill?

Mr. Gates: What agreement are you alluding to?

Mr. Beall: I am alluding to the agreement that you mentioned as being made when Carnegie was stirring up trouble.

How Mr. Carnegie Once Sold Rails

Mr. Gates: I would like to tell you a story. Along about 1887 or 1888 a man by the name of Harry Smith was the purchasing agent of the Missouri, Kansas & Texas Railroad. The price of rails at that time, if I forget not, was about $35 a ton. Mr. Carnegie's concern at that time was a member of a rail pool, and the penalty for cutting the price was enormous. I think it was $20 or $25 a ton. Mr. Smith happened to meet a friend of mine, a hardware merchant, at Sedalia, Mo., the agent of another company, and concluded he would buy his rails of him. He went to New York and happened to meet Andy Carnegie, whom he had known many years before, and Andrew cut the price very materially. Charges were preferred against the Carnegie Company. We questioned Mr. Carnegie and he denied everything in a general way. I knew the way he had cut the price. He had cut it by throwing in the track bolts, spikes and angle bars, which amounted to about 15 per cent. or a cut of $5 a ton. I finally made an open charge, or Mr. Stirling, the vice-president of our company, made it. He admitted all of the charges, but refused to pay any fine.

Mr. Beall: The real cause of complaint against Mr. Carnegie was that he would not abide by the agreement, but would insist on cutting the price?

Mr. Gates: He was like a bull in a china shop. He would get a thing into his head once in a while and go and do absurd things that I really think he did not think much about.

Mr. Beall: Would those absurd things usually result in reducing the price of steel products?

Mr. Gates: It might, or it might advance them. You could not tell what he would do.

Selecting the Business

The Chairman: Mr. Gates, you speak of the advantage of running at as full time as you can, with an unimpeded market, and the right to sell at such prices as you can get. How long has it been since that condition prevailed in the steel industry?

Mr. Gates: Well, as far as I know, the Republic has operated along that line right along. It is very important in an iron or steel rolling mill to select your orders. In other words, the price of ovals and rounds may be practically the same, but the cost of the roll change enhances the cost of making one article or decreases the cost of making another. Therefore, when I say to run unimpeded I mean to select your rolling orders. If you can run practically continuously for 12 or 24 hr. on inch rounds or inch hectagon or octagon, you get a great deal cheaper product. That is what is called, in steel parlance, selecting your business. Now, that always means a lower cost. The price of the extras on iron or steel may be equitable. They are all based on the scale, with an advance over the base price; but the mill that can select its orders, getting the largest amount of orders for one size, always runs and makes stuff the cheapest, and when I said selecting your business I meant selecting the orders you run by. For instance, if you were running on 75-lb. rails, American section, if you could run 30 days on that section, it would be a great saving on account of roll changes.

The Stability of Prices

The Chairman: We will assume that each one of the many producing concerns—manufacturing concerns and not holding concerns—was a separate corporate entity, as they were 20 years ago; say there are 200 concerns engaged in the manufacture of nails or wire or tin plate, and 50 or 60 engaged in the manufacture of rails, and a like number engaged in the manufacture of girders and structural steel. Now, if each one of those concerns was absolute master of its own business and was not controlled by or dependent upon some superior, some holding company or some financial influence that could dictate the price or the per cent. of its production, if that condition existed would not prices adjust themselves automatically to industrial conditions?

Mr. Gates: It would probably have that tendency, but I cannot say absolutely that it would. It would depend very largely on the supply and demand at the time. I would say that prices would be more erratic than they are now.

The Chairman: And you do not regard that lack of stability in prices as an evil, do you?

Mr. Gates: Well, if you were a merchant and had 10,000 tons of finished steel on hand, and they reduced the price $10 a ton, you would think it was an evil because you would lose $100,000.

The Chairman: But I mean, looked at from the standpoint of the whole community?

Mr. Gates: Well, it just depends on the viewpoint. There are two sides to the proposition. The largest owners of steel rails in the United States are the railroads, and when you depreciate the price of steel rails you depreciate the property of the railroads. When you advance the price of steel rails you advance the property of railroads. Now, if a railroad is not in the market to buy any rails in 1911 or 1912, they would naturally like to see prices high; but if they are in the market to buy from 100,000 to 250,000 tons they would like to see the market low; so that it is a good deal like the tariff proposition—it is local, it is individual, and you have got to take and treat each case as it comes along.

Extent of the Open Market

The Chairman: Take other articles of manufacture; in your opinion is it industrially wise to maintain the price at a fixed point, or to allow the price to oscillate with the capacity of the producer to pay, and other conditions?

Mr. Gates: I have been an advocate of open shop for a great many years and am to-day. I do not assume to speak for all my colleagues. By open shop I mean survival of the fittest.

The Chairman: That condition does not exist at the present time, I believe?

Mr. Gates: I do not think it does.

The Chairman: What per cent. of the steel industry is open shop to-day?

Mr. Gates: To-day? I should say 100, except rails. I do not think there is any agreement as to what shall be done in wire fencing or wire nails or woven wire or blooms or billets or ingots or anything else.

Underselling the United States Steel Corporation

The Chairman: Does not the open shop fellow sell at the same price, practically, as the corporation sells at?

Mr. Gates: Not necessarily. I have occasionally bought some of these products in Texas, and I write to the Pittsburgh Wire Company and the Pittsburgh Steel Company and the corporation, and I generally get a lower price from one of the outside concerns. The prices are not the same by any means.

The Chairman: What is the difference of price between these outside concerns and the corporation? Is it material?

Mr. Gates: Oh, yes. I do not know what you call material. I would say 10 cents a keg on nails would be material; 500 kegs of nails in a car would be $50 difference.

The Chairman: You do not mean to say that the independent manufacturers undersell 5 or 10 cents a keg, say, on nails, the corporation, as a rule, when the corporation has 75 or 80 per cent. of the business?

Mr. Gates: Well, they are very apt to.

The Chairman: How does the corporation hold the business, then, if the other fellow is underselling it 10 cents a keg on nails?

Mr. Gates: The corporation makes a pretty full line of goods, and I do not know that there is such a thing as coercion, but I could see where it would be possible for the corporation's agent to say, "If you do not buy your woven wire fence from me, when you want some electric wire I will make you pay for it," or something that the other fellow does not make. Now, I do not know that that is true, but I can see where they could put the screws to them, so to speak, in certain lines which the other people do not make.

The Pittsburgh Bridge & Iron Works, Rochester, Pa., has decided to establish an office in Pittsburgh, through which all Pittsburgh, Erie and Buffalo work will be handled. The office will be located at 703 Farmers' Bank Building, Pittsburgh, in charge of J. A. McEwen.

E. H. Gary on Co-operation

Remarks at a Luncheon Given to Certain Iron and Steel Manufacturers at the Metropolitan Club, New York, May 29, 1911.

Gentlemen, I thank you from the bottom of my heart for your attendance on this occasion. You have come here at considerable sacrifice to your interests and to your convenience. You have come here pursuant to a well-developed, considerate, affectionate regard for your associates in the iron and steel business. You have been requested to come here for the purpose of testing your intelligence and your grit. You have been requested to meet here for the purpose of inquiring, one of the other, as to whether or not you and your business can be entirely demoralized by the disposition or the action of one individual or a few individuals in the trade.

A Time for Careful Consideration

I believe this is a time when the iron and steel leaders should particularly take account of the existing conditions and carefully consider what course should be pursued in order to protect themselves in the future. There are many questions in which we collectively and individually are interested, aside from the mere question of securing for ourselves a few dollars. Just at this particular time our minds are filled with the late decision of the Supreme Court in the Standard Oil case. The entire public had been waiting most anxiously for that decision in order to determine, as far as possible, upon what foundation the business of this country rested and what it might expect would be proper and allowable concerning the future conduct of business. I have had an impression from the newspaper reports and criticisms that there might be some danger of misinterpretation of the language of the Supreme Court in that case, and if so, that much harm instead of good might result from that decision.

I would not undertake to enter into any legal discussion of the question involved, even if I were capable of doing so, but there is a view of the decision to which I ask your attention. You have read statements made by many different people to the effect that the Supreme Court had modified the Sherman law and had read into that act the word "unreasonable." I am inclined to think even if that were true, to which I do not agree, the adoption of that view and conduct based upon it might result in very great harm to the business interests of the country generally. And I offer, simply for your consideration, this view of the decision: that the Supreme Court, instead of saying that there may be reasonable restriction of trade or reasonable monopolies, intended to say that in the application of the law to the facts in a case there must be reason exercised. In other words, that the Supreme Court has said that there must be a reasonable application of the law to a case in point, rather than that the conduct itself, if in violation of the law, must be unreasonable in order to be a violation.

To make the point a little more clear, let me give you a single, simple illustration: there was a law passed in a foreign state to the effect that it should be unlawful to sell or give away intoxicating liquors. The object of the word "give" was to prevent an evasion of the law, as you may see. In a certain city within the borders of that state a brewer invited some of his friends for dinner. After dinner he and his friends visited the brewery and went into the office. While there he asked some of the men in attendance to bring into the room some beer, which was drunk by all who were present, and some kind—or otherwise—friend immediately commenced prosecution against the brewer for giving away intoxicating liquor. The Supreme Court stated that they thought it would be a most unreasonable application of the law to hold a man guilty under circumstances like that. Therefore, it is very important for the court, in determining whether the Sherman act is applicable to a particular case, to have before it facts which show whether the persons charged have intended to materially restrict trade or have intended to create and exercise a monopoly; and in ascertaining such intent and in passing upon such a case, you will see it is very material to consider what is the conduct of the parties interested or involved, and what is the intention of those parties.

They Suffer Who Pay No Regard to Others

Now why do I bring this up at this time? If the business interests of this country generally should reach the conclusion, by reason of the decision in the Standard Oil case, or the decision which shall be rendered in the Tobacco case, that the Sherman act, so-called, has been overthrown; that it is not of any importance so far as our future conduct is concerned; that we are not obligated to go ahead, on right lines; that we are relieved from the necessity of conducting ourselves in such a way as to evidence a regard for the interests of those with whom we come in contact—with our neighbors, with our customers, with our employees, with the public generally—that we may go on step by step, becoming worse and more unreasonable instead of better; we shall find that as a result and in the long run we will suffer by reason of such an attitude.

And if that is true, then it behooves us, gentlemen, to have in mind, uppermost in our thoughts, the one idea above all others that we should conduct ourselves in such a way as to make it certain we are of some benefit and not injury to all who are influenced by or interested in the result of our business. I consider this most important, gentlemen, and I hope when we find to what policy the Administration in Washington has settled down, for the governing and controlling of the great business interests of this country, that we steel and iron people in this country, instead of being found in opposition to that general policy which is calculated to be of benefit to the people of the country, will line up with the Administration and take a position foremost in the ranks of those who, in a patriotic way, are attempting to do what they can for their fellowmen. I do not care whether it is a federal incorporation act the lawmakers may determine upon, or what it may be, if it is reasonable or if it is determined by the Administration or the lawmakers to be reasonable, let us—occupying a great position in the activities of business life—let us take a leading part in doing our best to bring about an improvement in the conditions which surround us.

I throw this out for your consideration, gentlemen, and I hope you will give it due thought, and I believe that, when the final judgment by the administrators of the law is rendered concerning our part in the business activities of this country, it will be favorable to us if we occupy the high position which I have suggested. Remember, when we are talking about patriots, statesmen, leaders of thought and action in this country, that there is no one in Congress or anywhere else who has any higher duty or greater responsibility or stronger desire to promote the business interests of the people of this country than the men around this table. We do not need the suggestions of anyone in order to make up our minds as to what we will do when these questions of ethics and economics and politics are brought to our attention. We should be the leaders and not the followers.

Substantial Price Reduction Means Lower Wages

Now, then, gentlemen, I should like to suggest another thought which is applicable to the question of prices of our commodities. You know by my frequent and repeated statements that I have never stood for unchanging or unchangeable prices, nor have I ever advocated prices in any line which were unreasonable or too high, taking everything into account. I have never, to my knowledge, opposed the reduction of any price suggested by a majority of the iron and steel makers, after there had been full opportunity for consultation, and generally when any one of the iron and steel makers has, after due deliberation, made up his mind that his prices were too high and ought to be reduced I have not made any opposition in our company to following the lead of that individual; but on the other hand, I have advocated and shall always advocate, so long as I believe I have the right to do it, the stability of prices, the regularity of business conduct on the part of all that is calculated to recognize and advance the interests of all others.

I have urged you to remember and I again call attention to the fact that when you make substantial reductions in your prices, if you reduce to a price that is unfair and unreasonable and you make so small a profit that it does not yield you a fair return on your investment and your risk, you at least place for consideration before everyone the possible necessity of reducing the cost of production, including prominently, if not principally, the wages which you are paying, or may be allowed to pay, to the man or the men in your employ. Do not forget that the laboring men—the employees of the corporations—have more at risk, when these questions are considered of reducing prices below what is reasonable and fair, than the employer, because it is just as natural as it is right and fair that if reasonable profits are prevented and your prices are put down below what they ought to be, then as a matter of necessity you are forced to consider and perhaps decide in favor of a liquidation of the wages of your employees; and you have no right to disregard them and their interests. You have no right to run the risk of being compelled to put their wages below what they ought to be unless you are driven to it, and I hope, under the present circumstances, gentlemen, that whatever may be done, or whatever may happen as a result of present conditions, you will not reduce the wages of your employees until you feel it is an absolute necessity to do so.

We should undertake to place ourselves on a plane much higher than the demagogue or the reformer who attempts to assail us and who pretends to be the champion of the laboring man. We do not need any suggestions from people like that. We know what our duty is, we know what the rights of our employees are, and we feel obligated, and take pleasure in knowing that we are at all times doing all we can for the people in our employ in keeping their wages up and in bettering their condition and keeping them in a position where they may enjoy life. We are the ones to lead in this movement. So, gentlemen, I bring this up because I have read in some of the newspapers that there will undoubtedly soon be a reduction in wages—and we may be forced to it. I shall regret it if we are—but, gentlemen, let us not come to the conclusion of reducing wages until we are compelled to do so. Let us keep them as high as we can just as long as we can.

The Withdrawal of One Company Should Not Affect the Others

Now, we are confronted with a very serious and disagreeable problem. It is not for me to criticise men nor to pass judgment on the motives of men. Whether people who have changed their minds suddenly are actuated by motives of cupidity or motives of necessity is not for me to say. One thing we know that one of the leading iron and steel companies hitherto joining in our councils, learning from us our intentions, our business, our methods, our clients, our customers, everything of benefit and interest for one to know concerning his neighbor, has suddenly, for reasons considered good by those in charge, given notice that for the present at least it is not desirable to co-operate with us. If I believed the reason was that the officials of that company had reached the conclusion they had no right, from the standpoint of law or good morals, to continue, I would be the last one to criticise.

I would not expect to ask anyone to do anything he believed wrong, legally or morally; but on the other hand, gentlemen, if anyone who has been co-operating in a lawful way, not in secret, but under conditions well known and frequently exposed by all of us, suddenly changes his opinion and believes it is for his pecuniary interest for the time being to withdraw from associating with us and declines to give us any information concerning what he is doing or proposes to do, leaving himself free to go to your customers and mine and get the business for himself, regardless of price, and simply for the purpose of filling his mill temporarily and securing for himself a customer who has been your customer or mine, then I do not hesitate to say that, so far as I am concerned, I am perfectly willing to let him stand outside of the circle of intercourse and friendly conversation and open and aboveboard fair dealing and frankness in expression; but if I have sufficient influence, it shall not in the least affect the relations of all the rest of us.

Whatever we do with reference to prices, whatever we may decide is necessary in order to protect our interests on this occasion and under these circumstances, in my opinion it is highly important for the long future that we continue our relations of friendship and open and frank expression with reference to what we are doing. Now, I do not know the feeling of the rest of you; I do not know what you are disposed to do. I think that so far as we are concerned we would be largely influenced by the action of others; and while insisting upon the position from which I have never varied, I would not under any circumstances make any agreement, express or implied, direct or indirect, to maintain certain prices, to keep away from customers, to divide territory, to restrict output or to make any agreement of any sort or description with you or any of you, because, as I understand the law, I have no right to do it; yet at the same time, I would do what I have always said I would do, I would tell you and each of you at any time exactly what we were doing; I would give you the names of our customers, I would tell you what prices we were charging, I would give you any information concerning our business, concerning our mills, concerning our clients, concerning ourselves that you wanted to have, so long as you have the same disposition toward me.

Never before in the history of the business of this country, and probably of any country, have the people engaged in one line of industry occupied such a high position as that occupied by the iron and steel people in this country at the present time, and, gentlemen, while you may have read in some newspapers contrary statements made by people who were not interested in your welfare or the welfare of the people of this country generally and who talked from a political standpoint or selfish standpoint, yet you know as well as I that you have secured for yourselves the respect and the admiration of the well-thinking people of this country and of all other countries because of your attitude in these matters.

Friendly Conferences Have Added to the Stability of Business

While it may be true that as a result of your friendly conferences you have added to the stability of business in this country and have therefore been of great benefit to yourselves and to your customers and to your employees, yet, at the same time, in my opinion, taking into account the broader view and the long future of the business, you have done much more for yourselves in reaching this altitude which I have referred to, which, in my opinion, is the highest ever occupied by any men engaged in one line of business, and I believe that is more important to consider at this time than any other question we could take up.

Do not think that I minimize the troubles you are in—the troubles we are all of us in—do not think I am going to ask you to throw your business away or wreck your plants or disregard the rights and interests of your employees or any one else; do not think I overlook the business part of the questions which are involved and which are under discussion at the present time; but the question of mere dollars and cents, of making or losing a few dollars today or to-morrow or the next few months, in my opinion, is of slight consequence as compared with the better and higher things that you have had in mind during the last few years, and so it would please me immensely if you gentlemen, while considering the practical questions which are involved at the present time, should resolve, in your own minds, that so far as you can, so far as you have the lawful right, to stand together or at least to come together in friendly intercourse, not reserving to yourselves any question of information or knowledge you have, dealing in frankness and fairness, avoiding duplicity, avoiding questions of selfishness, dealing in the open, treating one another as friends, not as enemies, standing by and for one another, fighting for one another if necessary; protecting yourself against the man who undertakes to impose upon you and to override you and your interests, placing and keeping toward such a one a united front, not for the purpose or with the view of injuring him or any one else; but for the purpose of protecting yourselves and your interests.

If you have a customer located in some city who has a large stock of goods which he bought from you at a certain price, you have no right to disregard his interests and to unnecessarily reduce the prices to such an extent and in such a way as will force him into bankruptcy. I have already adverted to the consideration you must have for your employees. And so the same is true of the rights and interests of your associates. There is only a certain amount of business; you cannot increase it, you cannot change it.

You can get it away from your friend for a day or a week. Perhaps you can make a contract for a time and get a particular order, but in the long run, on the average, month by month, year by year, you cannot get and keep his business. The man you get to-day he will get from you to-morrow. There is only so much business, and if you have twice as much capacity as the demand, then it follows, as a natural and certain result, that, on the average, you are only going to get fifty per cent. of your capacity in orders. There is no possible way in which you can change that, except temporarily, and there is no reason why you should want to change it.

Confidence in One Another

I am not in a position to dictate to you, gentlemen, and if I were in such a position I certainly would have no disposition to do so. I am willing to stand with and by and for you, and you know, gentlemen, so far as our company is concerned, all share my opinion, that all have the same opinion. There isn't a man here who would not go to the president of our company and give him his pocketbook, and his order book, if necessary, and tell him to do what he pleased with it. You have confidence in him, you know you can trust him, you know he will never deceive you, you know he will never falsify, you know perfectly well he is dependable, and what you know of him he knows of you. Isn't that a splendid thing, that after these years—the last four years particularly—we should have been traveling together year by year, month by month, day by day, instead of ascertaining by this close contact how many tricks there were in each other's disposition, have formed a contrary opinion and have learned to have absolute confidence in one another? Gentlemen, isn't it a splendid thing? Was there ever anything like it before?

Of course if anyone believes that the time of co-operation has passed, if he deliberately and conscientiously reaches the conclusion that he is not serving his company by this disposition to conciliate and co-operate, then certainly no one could object to his saying frankly and boldly what conclusion he has reached, and we could all be governed accordingly; but if, on the other hand, we believe by long experience that, acting as we have and to the extent we have, within the lines of law and within the lines of reason and within the lines of propriety and good morals, we have been doing the best thing; then it seems to me that the first thing for us to decide is that we have no disposition to depart from the course which we have been pursuing; and if you reach that conclusion to-day, gentlemen, then some may have some suggestions of a more practical character to consider with reference to what is necessary, if anything, to be done at the present time, concerning this particular business in question. On the other hand, if it is your opinion that the time for co-operation has gone by or that it should be suspended, then we ought to find that out and we will all go our way, parting as friends, but at the same time separating entirely; which means that we will simply go upon our way, doing our own business in our own way, when, how and where we please.

What Would Happen Without Co-operation

What will be the result practically if we do that? Why, we will say here is a company which has a mill in a certain locality—it is not necessary to name that company, but it has withdrawn from our councils and it is not disposed to co-operate, and it proposes to do business in its own way and to charge such prices as seem to it necessary, in order to get the business it wants; in order to fill its mills. That company goes into a certain locality and finds Mr. King and Mr. McCullough with mills in that locality and it proposes to get the business of their clients and, in the ordinary way it goes to Mr. King's client and says "I want your business, and I will sell you bars at $1.10 and $1.05," and Mr. King's client says, "I think I can deal with you; that is pretty low, but I will let you know to-morrow morning," and to-morrow morning or before to-morrow morning Mr. King's client goes to Mr. King and says, "I am offered bars at $1.05. Do you want to lose that business; do you want to lose me?" and Mr. King says, "Well, no, I don't think so and if a company is offering bars to you at $1.05, I think I will let you have them." "Well," the man says, "then I think probably I will stick to you. I will let you know to-morrow morning." And he goes to Mr. McCullough and goes through the same thing there and Mr. McCullough says "Is Mr. King offering them at $1.05?" "Yes." "If Mr. King has done it I am surprised, but I think I will let you have them at $1.04. You are Mr. King's client but I want business and I will let you have those bars at $1.04," and he plays those two against each other as long as he can, but finally he goes back to this first company, which started the trouble, and closes with it at $1.

In other words, the customer is not playing this one company against all the rest, but he is going to get others in there and they are playing against one another, whereas, if they were in consultation or co-operation, Mr. McCullough, when he received the offer would go to Mr. King and say, "Your customer has been around and says that an outside company will sell at $1.05," and then Mr. King and Mr. McCullough find out about where they stand and the man has failed to play them against each other; and if they have to deal in such a way as to prevent this outside company from taking the business they at least know what they are doing and they did not have to fight each other.

The point is stated in a rather bungling way, but you gentlemen who are in business from day to day know better than I do how it is done. And if you are in consultation and each knows what the other is doing, you cannot be used against one another. Having full information as to what one another's prices are, you can take care of yourselves against the one company who is entirely outside of your friendly and proper co-operation. That is the point.

Now, I have about finished. I am going to call on one or two others, with a view of developing the question as to whether you think, under all the circumstances, it is better for us to part friends and say, "Let every man take care of himself." If you think, for any reason, it is necessary for it to be done or that it ought to be done, then I hope you will be frank enough to say so, that we may have an understanding. My judgment is entirely to the contrary.

We have not only enjoyed the association with you gentlemen but you have been of great benefit to us. It has been not only a great pleasure, but it has been a great profit and we have made money for ourselves and we have pleased, by our conduct, every one who is interested in us.

Among other things, when demand was great and the capacity was insufficient, we have prevented prices from going higher, which is just as important as to prevent them going too low. One is just exactly as important as the other. I am sure I have never stated an opinion here which I did not believe was in accordance with the opinions of the rest of you—I have never intended to disregard your opinions or go outside of and away from them; I have tried to find out what was in your minds and have acted and talked in accordance with what I believed to be your own wishes and your own conclusions, and I say that we have never stood for unreasonably high prices any more than we are willing to have unreasonably low prices. What we advocate is stability of prices. We know our customers like that. We know it is better for the mills, we know it is better for the employees in every way. That is why I think it is of great importance for each of us to know all the time what the rest are doing.

Enlarged Plant for Goulds Mfg. Company

The Goulds Mfg. Company, Seneca Falls, N. Y., is about to build four large additions to the No. 2 plant, in which will be housed the part of the works known as the No. 1 plant. Part of the No. 1 plant must be torn down to make way for the new Erie Barge Canal. The new buildings will be parallel with the foundry buildings.

A one-story storage building for rough castings is completed. The building is 60 x 240 ft. and of mill construction. Two machine shops, 100 x 300 ft., will parallel the storage building. They will be of steel frame and brick construction and about 70 per cent. of the wall surfaces will be glass. South of the two machine shops a four-story warehouse, 60 x 240 ft., will be built. It will be of reinforced concrete and on the south side there will be a loading platform. The New York Central Railroad is to build two additional switches along the warehouse.

The new buildings will be lighted by tungsten clusters and will be heated and ventilated by the hot-blast system. All the equipment of the machine shops will be motor driven. It is expected that by November 1 the buildings will be ready for use.

Mechanical Engineers' Meeting

Spring Sessions of the American Society of Mechanical Engineers, Pittsburgh, May 30 to June 2

It was conclusively shown by the attendance at the semi-annual meeting of the American Society of Mechanical Engineers, held at Pittsburgh May 30 to June 2, that the members prefer to convene in cities where there are places of engineering interest to visit. A year ago at Atlantic City the papers presented were probably fully as important and valuable as those at this meeting, yet the attendance was less than half as large. In fact, the registration was only 25 less than that of the record-breaking Detroit meeting, which was favored by the coincident meetings of the automobile engineers and on engineering education. Even assuming that the joint meeting in England last summer caused some to forego the Atlantic City meeting, it would not account for so great a disparity in the attendance last year and this year, for it developed that a goodly proportion of the members who went to England had been also to the Atlantic City meeting.

Pittsburgh proved a wise selection for this spring meeting, as it was undoubtedly the importance of its industries and the promise of profit from the excursions that would be arranged to the various works which brought such a large attendance. The local committee deserves the highest credit for the arrangements made to entertain the visitors and obtain admission for them to the different plants, and a very large measure of thanks is due to those connected with the works who extended courtesies to the society members and their guests.

Viewed in the retrospect, the honors for the practically complete success of the meeting should be divided between the local committee, consisting of E. M. Herr, chairman; George Mesta, J. M. Tate, Jr., D. F. Crawford, Chester B. Albree, Morris Knowles and Elmer K. Hiles, secretary, for the elaborate preparations for the excursions and other entertainments and the furnishing of printed matter giving the leading points regarding the places of interest to be seen, and the meetings committee for carefully selecting papers on subjects nicely fitting in with the excursions. The cement works session, Wednesday morning, for example, was followed by an excursion in the afternoon to the works of the Universal Portland Cement Company. Similarly the discussion on large gas power plants at the session of the Gas Power Section was principally based on equipments operating in the local steel works, and the visits to these works was of especially important relation to the papers presented at the steel works session, Friday morning.

The headquarters of the meeting was the Hotel Schenley, and the sessions were held in the Carnegie Institute and the main building of the Carnegie Technical Schools. The usual matters of business were quickly dispensed with at the first professional session, held Wednesday morning in the Carnegie Institute, President E. D. Meier presiding. Secretary Calvin W. Rice then read invitations to hold the next spring meeting in Cleveland, St. Paul and Baltimore. It was requested that the members signify in writing as promptly as possible their preferences, and it was later announced that the Council had decided upon Cleveland.

CEMENT WORKS SECTION

Proceeding to the consideration of the papers prepared for presentation at this session, it was announced that the meetings committee, having decided to try to broaden the scope of the society's activities, had appointed an auxiliary committee to canvass the industries to see what subjects should be taken up. The cement industry was the first to respond; hence this session. Following is an abstract of the first paper:

Some Problems of the Cement Industry

BY WALTER S. LANDIS, SOUTH BETHLEHEM, PA.

Progress and improvement in the cement industry has and will resolve itself into the development of the plant as against the process. The chief features of interest in this plant development are the questions of size of first crushing unit, the fineness of grinding of the raw materials before entering the kiln, the gradual displacement of the wet process by the dry one, better utilization of the fuel in the clinkering of the raw material and the abandonment of the air separator. The older mills must be remodeled along the lines of more economical power distribution and labor requirements to successfully compete with the modern mills, now that profits in cement manufacture have dropped so low.

Instead of presenting his paper the author gave, by means of lantern slides, an illustrated explanation of the machinery used. It was decided to present all of the papers and discuss them in a body, and abstracts of the remaining two follow:

The Edison Roll Crushers

BY W. H. MASON, STEWARTSVILLE, N. J.

The causes leading to the design of the Edison crushing rolls are outlined and a comparison is made of the energy of coal as compared with that of dynamite in breaking up stone in the quarry. A description is given of the method of quarrying now employed in conjunction with Edison roll crushers. These rolls store up kinetic energy for use in crushing and sledging large stones and a comparison is made in this connection of rolls of various sizes. The power required for crushing by this method is shown by tachometer records, from which speed, energy and horse-power curves are plotted. Records are given covering a period of two years of the time lost and the cost of repairs on the crushing plant at the Edison Portland Cement Company. Comparisons are made between the theoretical capacity of these rolls and the actual capacity as shown by tests. Both of these are enormously greater than for the gyratory crushers, and in addition the larger size of the stones which can be handled by the rolls greatly simplifies and cheapens the quarrying operation. A description is given of the crushing plant of the Tomkins Cove Stone Company, which has a capacity of 1000 tons an hour.

Power and Heat Distribution in Cement Mills

BY L. L. GRIFFITHS, CEMENT, DALLAS CO., TEXAS.

A comparison is made in this paper of the methods used and the results obtained in five different cement plants for converting the thermal power of the fuel into productive mechanical work. A brief description is given, both of the power installation and of the mill arrangement; and the relative efficiencies of different raw materials, types of grinding machinery and engineering arrangements are considered. The data are such as to enable comparisons to be made between the same types of machinery, and in most cases the same size and make of machinery, at least in individual departments, if not throughout the entire plant.

Frank B. Gilbreth asked if there is anything to keep cement from setting too quickly and not hurt it, and the reply was made that gypsum can be used. Plaster of paris is put in when cement is manufactured for that very purpose. Too much will cause it to set quicker still. Sugar and calcium chloride are other ingredients that can be put in to retard the setting of cement.

W. R. Dunn stated that waste heat is being used extensively for drying the raw materials and answered a question as to the extent of the loss of material as dust by saying that it is not known. Mr. Landis took exception to this, stating that they do know about the percentage of loss, and H. S. Struckmann reported that 5 to 7 per cent. is lost up dry kiln stacks.

Germany, he advised, is getting around to the wet process to cut down the loss of material. The consequent saving has been found to more than make up for the loss of economy. Now by combining a drying cylinder and a burning cylinder in one long one it has been found that good economy is obtained, and the dust problem is very largely overcome. Mr. Landis stated that the loss of dust

is very often close to 5 per cent. He believes that the Western wet mill gives a higher per cent. of dust than the Eastern dry mill. Mr. Struckmann is convinced that economy is merely a mechanical problem and that the wet process will cure the dust problem. He agreed that dust does go out of the wet kiln, when that point was raised, but that it is very much less. He believes that coaling should be done with a spray nozzle.

Another speaker suggested re-designing the back of the kiln where dust collects and there is now an opening would reduce the loss of dust. Still another stated that he has had considerable success in catching dust. In testing it out, where they had thought the waste was only 3 or 4 per cent., they found that in reality it is 5 to 5½ per cent. His plant was located near a furniture factory, and they were compelled to do something to reduce the dust disseminating from their works. They found that by spraying water in the bottom of the stack they were very successful in stopping the annoyance their neighbor had experienced.

J. M. Hemstreet, discussing Griffiths' paper, stated that he had had occasion to design some stone crushing machinery and had considered the type of drive. He inspected a number of installations and found that the consensus of opinion was in favor of electric drive. He was surprised to find that Mr. Griffiths' regarded the electric drive as not efficient. On this point Mr. Griffiths replied that it was his experience that shaft drive is much cheaper but that electric drive is better for small individual drives.

An English guest asked about our manufacture of blast furnace slag cement. Mr. Kinney replied that his company finds that the Government and many engineers now consider such cement as good as any.

Mr. Landis wanted to know if, considering all the power consumption for pumping, agitating, etc., the wet process is not very much less economical than the dry. Mr. Struckmann replied that experience abroad is a good indication of the contrary, for fuel there is very expensive, and yet the wet process is most in favor.

W. R. Dunn, speaking as one of them, stated that the manufacturers of cement are very glad that the society has taken up the subject of cement manufacture and that they will be very glad to co-operate with the society in any further work that may be done with a view to studying means for improving machinery and processes.

MACHINE SHOP SECTION

At the Wednesday evening session three papers on the manufacture and assembling of small parts were presented. Following are abstracts of these papers:

The Assembly of Small Interchangeable Parts

BY JOHN CALDER, ILION, N. Y.

The direct cost of assembling small interchangeable parts is a comparatively large item in light mechanical engineering and repetition work. Economical production demands that easy assembly be kept in view at all stages from the design of a mechanism and through the tooling and shop processes to the delivery of the unit parts to the assembler. The paper analyzes and illustrates all the elements which should enter into the producer's calculations and outlines the work's organization necessary to secure the rapid and economical production of suitable unit pieces. It describes the results obtained in the assembly of given pieces and illustrates the simple apparatus used and the place that preliminary time and motion study has in assuring that the shop shall, from the first, begin operating upon the assembly of the mechanism under the most economical conditions.

The Process of Assembling a Small and Intricate Machine

BY HALCOLM ELLIS, NEWARK, N. J.

The Ellis adding-typewriter is a combination typewriter and adding machine composed of about 3400 pieces. To secure rapid and economical assembling of such a large number of parts a very elaborate system is necessary. Not only is the machine designed to be assembled in sections, but some of these sections are divided into sub-sections, small groups of assembled parts and individual pieces, all of which are numbered. All the parts are produced by means of carefully made dies, jigs, and fixtures so as to be interchangeable without special fitting. During the manufacture of the various parts a record is kept of the successive operations on each one, so that it is possible to tell at a glance what stage each piece has reached at a given time. The sheet on which these records are kept is called the operation docket. When a stock of parts has been produced, each section and sub-section is assembled independently by means of assembling charts and photographs of the parts required for each section. Numerous illustrations show the method employed and various stages of the work from the production of the parts to the completed machine.

Quantity Manufacture of Small Devices

BY F. P. COX, WEST LYNN, MASS.

This paper deals with the production of small but not particularly complicated devices. It assumes that the apparatus has been properly designed for economical manufacture, and discusses the organization of the shop. The author considers it essential that change of design, except at stated periods, should be avoided; that the responsibilities of the different assistants should be sharply defined, and should not overlap; that stock handling is of the greatest importance in order to avoid interference with the labor cost, and that the chief function of an organization is to assist the workmen to perform a maximum of work with a minimum of effort. Recognizing and fully believing in scientific management, he contends that an organization should be sufficiently flexible so that ability in whatever form it may be found may be used to advantage, and in no case should the man be sacrificed to the system.

In the course of the discussion the methods used by the Western Electric Company in assembling small telephone parts were brought out. The raw materials and tools are inspected by the production department and are not under the sole control of the purchasing department, as suggested in Mr. Calder's paper. The testing, rate setting and methods department does not have charge of the actual work in process in the shop. No reaming, tapping or bending operations should be done in the assembling department, and the use of the file should be absolutely prohibited.

L. K. Malvern asked if the foremen or leading men who are called into shop conferences give honest and unbiased opinions. Mr. Cox replied that in his experience they do. The employees in the rate setting department are recruited from among the most intelligent workmen in the shop and are paid a high day rate. One speaker asked Mr. Calder to give some data on the difference between the rate in assembling small parts attained by the highly skilled rate setter and the average workman at the bench.

The next paper has already been printed in *The Iron Age*, but for convenience an abstract is given.

Milling Cutters and Their Efficiency

BY A. L. DE LEEUW, CINCINNATI, OHIO.

Observations of present-day practice and a number of experiments point to the fact that better results can be had from milling cutters by increasing the tooth space and depth. A number of cutters constructed along these lines were tested and it was found that they have a number of points in their favor, among which are less consumption of power, a greater amount of work done for one sharpening and a greater number of possible sharpenings per cutter. A change in the form of chip breaker made it possible to use cutters with chip breakers for finishing, as well as for roughing. It was further found advisable to use a special kind of key, here described, for heavy work. Finally, this paper describes a new style of face mill and what is called a helical mill. A number of diagrams are presented showing the relative efficiency of different styles of mills for removing a given amount of metal. In general, attention is called to the possibilities which lie in a more scientific construction of milling cutters and the desirability of discarding our ideas of milling cutters, which are largely based on conditions no longer existing.

John Parker in a written discussion contended that the average machine shop will not purchase milling cutters with wide spaced teeth but demands the standard fine toothed tools. He admitted that the power consumption of cutters with wide spaced teeth is much less than that absorbed by standard cutters, but claimed that the hammering due to the relatively few teeth is very detrimental in a great many cases. The new cutters occasionally push the work bodily out of the vise, and end mills of this design are inclined to work loose in their sockets. He gave details of a large number of tests of both types of cutters on cast iron and steel which showed a saving in power in favor of the new tool of from 14 to 20 per cent. Mr. De Leeuw's statements regarding the tendency of standard cutters to clog with chips were disputed, and tests were mentioned where standard cutters under a feed of 10 in. per min. cutting 0.4 in. deep did not clog. Mr. Par-

ker believed the new cutter more economical in the use of power, but not suitable for general purposes.

A. F. Murray agreed with Mr. De Leeuw's conclusions regarding the possibilities of the new cutter and described several heavy face mill cutters with inserted teeth designed on this principle. He also described some end mill cutters with only six or eight teeth.

W. S. Huson said he favored the use of wide spaced teeth on surface mills, but had not found this type successful in slot milling or gear cutting. He favored the use of cutters with a large number of teeth for accurate gear cutting, although they are more expensive to keep in good order.

Concluding the discussion, Mr. De Leeuw said he did not recommend the new cutters in a sweeping manner, or that all existing cutters should be replaced by the new type, but did believe firmly that cutters with a few rugged wide spaced teeth are better in many cases than the standard design. He pointed out the saving in time in sharpening the new cutters and said they can be ground twice as many times and wear at least twice as long as the old style.

GAS POWER SECTION

Simultaneously with the machine shop session was held a session of the Gas Power Section in the main building of the Carnegie Technical Schools. Prof. R. H. Fernald, chairman of the section, presided, and the meeting was opened with a reading of the report of the installation committee by Secretary George A. Orrok covering the records which it has collected of recent installations of gas power equipment.

Discussion of Large Gas Power Plants

Of direct interest in connection with the excursions arranged for the members of the society by their local committee was the discussion of large gas power plants on the part of those having in charge notable examples of such plants in the Pittsburgh vicinity. The discussion was opened by E. A. Maccoun, superintendent of furnaces of the Edgar Thomson steel works. He first drew attention to the characteristics of the card of the four-cycle engine, particularly the high initial pressure, 300 lb. or more, and the low mean effective pressure, 65 lb. If it should prove that some new cycle is developed for slow combustion, engines will not have to be designed for such high maximum pressures in proportion to comparatively low mean effective pressures. At the Edgar Thomson steel furnaces one blower engine has operated 93 per cent. of the time during an entire year. Another blower engine operated 90 per cent. of the time and an electric engine 85 per cent., which speaks well for the reliability of such engines. The speaker next mentioned some of the changes which were necessary to make their engines operate satisfactorily, for they must run nearly continuously to be economical. Important factors are first cost and an operative cost comparable with that of steam engines. All troubles due to cylinder design have not yet been overcome. Cylinders have a tendency to crack and allow water to leak into them. They must be carefully water jacketed to prevent unequal expansion. The speaker favors steel castings because they allow thinner walls. The cylinders should be in halves and bushed so that the lining may be easily renewed. He considers that 44 in. should be about the minimum diameter for cylinders.

For pistons he stated that cast steel is used the most and that the pistons should be made in parts. A design approaching a sphere gives enormous strength and allows more expansion. The piston should float, so that there is no pressure on the walls of the cylinder except that due to the rings. Piston rods were first made of nickel steel, but open hearth steel he considered as more satisfactory. The cooling water should be introduced and taken out through the ends of the rods, as holes through the sides make excellent places for cracks to start. Fiber rings in connection with piston rod packing should be solid and of sufficient number to reduce the pressure before it reaches the packing proper.

Originally the company had trouble with its cylinder heads, but by changing the design this has now been overcome. One requirement for a satisfactory inlet valve gear is that a reasonable percentage of dirt should not cause excessive wear. Concluding, the speaker compared the advantages of the constant mixture and constant pressure systems and stated that the oil relay governor has been found the most satisfactory.

R. H. Stevens, mechanical engineer, of the Homestead Steel Works, was the next speaker and related the experience at the Carrie furnaces with four blower and five electric engines. In the cleaning plant there are six units. Over 99 per cent. efficiency is obtained in the cleaning, only 0.003 grain of dust per cubic foot remaining in the gas. The gas has from 85 to 90 B.t.u. per cubic foot thermal value. They have been fairly successful in their operation, the engines being ready to run 95 to 98 per cent. of the time, although they only have to run about 90 per cent.

A. N. Diehl, superintendent of furnaces of the Duquesne Steel Works, introduced his remarks by contrasting the thermal values of fuels used in internal combustion engines which range from 1000 B.t.u. for natural gas to 175 B.t.u. for producer gas and 90 B.t.u. for blast furnace gas. The last is ideal for gas engine operation on account of the slow flame propogation and permitting high compression. He next described the nature and characteristics of the gas they obtain and the cleaning apparatus used. It was found that they got the best results with spraying in the scrubbers. A study of the course of the gas in the scrubber led them to design a spraying device to prevent channeling of the gas. The speaker then described in detail the course and treatment of the gas. The engine details were similarly described, including the valves, governor, etc. Their governor was very satisfactory, holding the speed of the electric engine within 2 per cent. and the blower engines within 5 to 6 per cent. The maximum efficiency obtained in these engines was 30.9 per cent. Electric engines developing 3300 kw. gave 4807 b.h.p. and 5641 i.h.p. The engines are started by compressed air. In the last six months of operation the engines have averaged 98.8 per cent. operating time.

A. L. Hoerr, steam and hydraulic engineer, of the National Tube Works, at McKeesport, described their installation and its history. Some of the changes made in their engines were as follows: The piston-cooling water system had telescopic joints substituted for swinging joints; the design of the spark plugs was changed to use a rotary instead of a reciprocating motion; the gearing on the lay shaft was changed from spiral to spur type; the connections between the exhaust valves and the mufflers were equipped with expansion joints; the design of the keepers was changed, and also that of the piston rod packing rings, and a slight change was made in the exhaust chambers. From the operating records of 1910 it was found that engine No. 1 operated 79 per cent. of the time with an average load factor of 81 per cent., and engine No. 2 for 91 per cent, of the time with an average load factor of 79 per cent. After giving some further details the author concluded with the opinion that in this district it is still possible to do better with steam engines than with gas engines.

H. J. Freyn, Illinois Steel Company, commenting on the remarks of the previous speakers, found it difficult to reconcile their apparent doubting that gas engines are as good as steam engines when they all reported engines operating as much as 95 and 98 per cent. of the running time. No prime movers, he stated, could do much better. At Gary recently one-quarter of one per cent. was all the delay charged against gas engines. While in Europe last year Mr. Freyn was surprised to see how excellently gas engines are running there. While our experience with gas engines is relatively short, he believes that we can do as well as is being done in Germany, for example. He mentioned that most of the installations referred to by the previous speakers were made some time ago and in most cases were practically their builders' first attempts. He contrasted with these the Snow engines at South Chicago and some other makers' recent products as examples of what can be done in this country now. Our need, as he sees it, is better workmanship and not so much better design. He considers that foundry practice is better abroad and that this is the reason why they have less cracked cylinders. Foreign builders have not adopted steel cylinders, and the speaker thinks that cast-iron cylinders are entirely suitable when properly made. The rod packing as used in this country he regards as better than that used abroad. Mr. Freyn took exception to the figures which have been circulated in this country as the cost per kilowatt for gas engine installations, regarding them as altogether too high. While the gas engine installation does cost more than a steam turbine or a steam engine installation there is not so great a difference as is com-

monly believed, and he held that the saving in operating expense more than offsets it. Another factor in gas power plants as operated in this country which he considers is superior to that used in Europe is the gas cleaning apparatus. He recently opened an engine which had been running for a very long period and found it in splendid condition, with not a handful of dust or carbon deposit in it. Finally the speaker ventured the prediction that the combination of low pressure steam turbines and gas engines will be found to be very economical.

Mr. Friedlander, who contributed to the discussion, argued that gas engine units of larger capacity should be built. A fair figure for the present cost of gas engines, he held, is $125 per kw. It is his belief that the speed of gas engines should be increased and that they should be made operable by unskilled labor.

U. S. Bureau of Mines Test

The programme of the evening was concluded by a paper read by C. D. Smith covering the work of the United States Bureau of Mines, Pittsburgh Station, on the prevention of mine accidents and fuel tests. The paper was followed by lantern slide illustrations from photographs, illustrating some of the measures which are taken to safeguard mine employees.

MISCELLANEOUS SESSION

A session was held on Thursday morning in the lecture hall of Carnegie Institute and was opened with the presentation by Prof. Reid T. Stewart of his paper, "Stresses in Tubes." He described an extended investigation which showed that the stresses in the wall of a tube exposed to external fluid pressure are of the same character as those in a column having ends fixed in direction. Using the experimental results obtained for the collapsing pressures of commercial steel tubing, 3 to 12 in. in diameter, he derived equivalent column formulae.

Charles Whiting Baker regarded the offer made by Professor Stewart of presenting to the society a bound volume of the original data on which the present and his former papers were based as marking a departure which could well be imitated more generally, and on his motion a formal vote of thanks was given to Professor Stewart for his acceptable contributions augmenting the paper.

The Purchase of Coal

The purchase of coal, the subject of a paper by Dwight T. Randall, of the Arthur D. Little Laboratory, Boston, was discussed for the author in his absence by Perry Barker, who is associated with Mr. Randall. The contention of the paper was in part as follows:

Most boiler-rooms are now conducted in a manner which permits of considerable saving along two lines. (*a*) the selection of a coal which is suited to the plant and at the same time is capable of delivering the greatest amount of heat to the boiler for a unit of cost; (*b*) burning the coal by approved methods to obtain the highest practical efficiency.

The coals which are offered in almost any market very in price and in quality to an extent which justifies a careful study of their character and heating value in order to determine which coal will prove most economical when the equipment, the load conditions and the price are considered. A coal which is entirely satisfactory in one plant may be unsuited to another.

It is possible to burn almost any fuel with reasonably good efficiency provided the furnace is properly designed for the particular fuel to be burned.

Coals which are suitable for any given equipment depend for their value principally upon the B.t.u. and the size of the coal. A thorough study of coals and the variations in their quality has naturally led to the purchase of coal under specifications with a guaranteed analysis, which provide for a definite procedure in case of a variation in the quality of coal delivered.

The author explained at length the methods of obtaining the proper sample of a fuel, discussed the accuracy of sampling and suggested the important items of the proper type of coal specification. Secretary Rice expressed a fear, as a member of the Committee on the Conservation of Natural Resources, that the whole tendency, unwittingly perhaps, was to maintain a market for the best grades of coal, assuming a general rigorous following of the procedure advocated in the paper. Charles Whiting Baker, as a member of the same committee, voiced approval of the attitude of Mr. Rice and suggested the feasibility of wider use of the steam jet blower for the use of low grade fuels. A reduction in fuel and incidental costs, he added, was good engineering. Dean Goss advised more attention on the part of the coal producers to making the inferior coals a satisfactory marketable commodity, as by briquetting, for example. President Meier said he believed in coal analysis if the coal be taken from a definite locality. Mr. Barker in closing the discussion explained that the paper emphasized the need at the outset to study the kind of coal it is desirable to use. The trouble with the low grade coals, he remarked, is that they have too great variations in constituency.

Pipe Flange Standards

The final step in the matter of standardizing flanges of steam pipes and the like was taken by the society in ordering the schedule to be printed. A telegram was read from Henry B. Gombers, Secretary of the National Association of Master Steam & Hot Water Fitters, stating that that association has accepted the joint committee report on the subject. The action of the society in this case is important, as it never actually goes on record as adopting a thing of the kind but recommends a standard, as was its action in reference to the code for testing steam power boilers, a contribution to mechanical engineering which has given the society a very good reason for existence from the standpoint of the public at large.

The schedule covers standard weight and extra heavy flanged fittings. The tables give in convenient form the leading dimensions for elbows, including the long turn, for tees and crosses and for laterals or Y-branches, and the range of pipe sizes is 1¼ in. to 24 in., inclusive. A few modifications are yet to be made to the schedule, it is understood, and without doubt it will be available shortly in pamphlet form purchasable for a nominal sum like the separate copies of the Society papers. The committee of the American Society of Mechanical Engineers was: Henry G. Stott, superintendent motive power, Interborough Rapid Transit Company, New York; John H. Sparrow, chief engineer, New York Edison Company, New York; William Schwanhausser, chief engineer, International Steam Pump Company, New York; Walter M. McFarland, Babcock & Wilcox Company, New York; Albert C. Ashton, Ashton Valve Company, Boston, Mass. The committee of the National Association of Master Steam and Hot Water Fitters was: William J. Baldwin, Jr., New York; N. Loring Danforth, Buffalo, N. Y.; William T. English, Boston, Mass.; William P. Kirk, Bridgeport, Conn.; Thomas B. Cryer, Newark, N. J.; Edward B. Denny, Newark, N. J.; Charles A. Geoghegan, New York.

Vice-President Goss relieved Colonel Meier as presiding officer for the remainder of the session

A paper on the "Energy and Pressure Drop in Compound Steam Turbines" was then presented by its author, Prof. Forrest E. Cardullo. He submitted an empirical formula for estimating the quantity of power developed in each stage of such a turbine. The equation is modified so that by its aid the proper pressure drop in each stage may be determined. A graphical solution of the problem was also developed. The methods outlined are applicable, it was stated, to the solution of problems in turbine design when a temperature-entropy table or a total heat-entropy diagram is used. The paper was discussed by Winslow H. Herschel and in writing by Profs. Peabody and W. D. Ennis.

The pressure-temperature relations of saturated steam were discussed in a paper by Prof. Lionel S. Marks, read by title only on the basis that this discussion should advisedly be contributed in writing. The paper mentioned that the pressure-temperature relations of saturated steam are established satisfactorily from 32 deg. F. up to the critical temperature. The values of the pressure have a maximum difference from the best experimental value of about $^1/_{10}$ of one per cent. in the range from 212 deg F. to the critical temperature (706.1 deg. F.); below 212 deg. F. the maximum difference is 0.196 per cent. at 50 deg. F., corresponding to a pressure difference of 0.00035 lb. per sq. in.

Pressure Indication for Punching Machinery

The last paper of the Thursday morning session was by Prof. Gardner C. Anthony on a "Pressure-Recording Indicator for Punching Machinery."

The use of an indicator for the direct recording of stresses due to punching boiler plates, under the working

conditions of a boiler shop punch, the author believed to be new. The paper was largely descriptive of a device for obtaining cards from an indicator applied to a pressure cylinder, which enables the operator to obtain results as easily and rapidly as is done in indicating an engine. Cards were taken with the apparatus applied to an Olsen testing machine. The latter was for the purpose of checking certain results and introducing a variety of conditions which it is proposed to investigate.

Although the number of tests so far made is insufficient for conclusive evidence, they have demonstrated the efficiency of the device as a piece of laboratory apparatus which will serve admirably for determining data relating to the following: The maximum pressures for which punching machines should be designed, the point of maximum stress in the punching of plates and other material, the effect on the maximum stress by increasing the clearance between punch and die, the advantages to be derived from the use of shearing punches, and finally, the effect of time on the flow of metal in punching.

Prof. R. C. Carpenter thought the author ought to explain conclusively whether the indicating scheme is sufficiently proof against the loss of leakage of the oil used as the hydraulic medium and whether the sticking of the indicator owing to the medium is safely overcome. Julian Kennedy suggested a horizontal arrangement of the apparatus and the use of a spring and a record of its deflection for obtaining a study of the conditions.

STEEL WORKS SESSION

The Friday morning session was opened with the adoption of a resolution presented by Mr. Baker expressing the thanks of the society and the visiting members for the notable arrangements made for the meeting and the elaborate programme of entertainment.

Furnishing the Furnace Blast

A paper was then read by Richard H. Rice, of the General Electric Company, describing the commercial application of the steam turbo-compressor at the plant of the Empire Iron & Steel Company, Oxford Furnace, N. J.

The details of the installation were given in *The Iron Age* of March 2. With this paper was also read the paper by Prof. W. Trinks, of the Carnegie Institute, on "Reciprocating Blast Furnace Blowing Engines," in order to concentrate discussion.

The paper set forth the causes for the gradual change and progress in reciprocating blowing-engine practice. An elementary study of valve motion was given and the valve gears of present standard American practice were described. It was shown that these engines are successful at the speeds for which they were designed, but that at higher speeds they cannot be used successfully, so that new designs had to be brought out in order to meet the pressing demand for higher speeds and lower first cost. Two American designs described showed that these valve systems, although much superior to the so-called standard gears when used for high speeds, have not yet broken with the idea that smallness of clearance is required for economy, whereas German builders have demonstrated that by the use of multi-ported plate valves large valve areas and economy at high-speed operation can be obtained in spite of large clearance. It was pointed out that the bringing up of the piston speed of the blowing engine to the standard piston speed of the power gas engine or the power steam engine reduced the first cost of the reciprocating blower and that the combination of the high-speed blast-furnace gas engine with a high-speed blower constituted the most economical method for the production of furnace blast.

A written discussion contributed by J. E. Johnson, Jr., Ashland, Wis., was read by F. R. Low. It was in part as follows:

Changes in quantity of air as small as 1 or 2 per cent. are frequently made in the quantity of blast delivered to the furnace as one of the means of controlling its operation, and this makes it obvious that exact control is a very necessary feature. I had the pleasure of seeing the installation of the turbo blower at the Port Henry plant of the Northern Iron Company about a year ago, and the simplicity of the governor is certainly admirable, but is a feature exactly not easy of comprehension to a man without thorough mechanical training, and a prejudice against these machines is likely to exist in the minds of many furnacemen on this account, which will make their introduction slower than they perhaps otherwise might be.

It is a well-accepted fact that the efficiency of the turbine is far higher at low pressure than it is at high. The result is that the most economical form of steam-driven apparatus is a combined unit in which the steam expands down to about atmospheric pressure in a good reciprocating engine, and is then delivered to a turbine on its way to the condensers.

In spite of their high cost it is notorious among operating men that really reliable blowing engines are exceedingly scarce. The problem of the valves is in itself one of great difficulty. It is almost impossible to get an air inlet valve with sufficient area to allow the cylinder to fill absolutely without heavy loss by suction, and at the same time quick enough to give correct results at the speeds required of modern engines.

The turbo blower, on the other hand, suffers from the disability that it must have stages enough to blow the highest pressure ever required, although this high pressure will not, in ordinary operation, be required 1 per cent. of the time, the normal pressure being perhaps only half as great.

If, therefore, we make a turbo blower to deliver air of a certain nearly constant, moderate pressure, and a blowing cylinder of comparatively small size strong enough to deliver air to the desired maximum pressure, we shall have bettered the conditions of operation of both apparatus, increasing their efficiency and reducing their cost. In other words, the turbo-blower and reciprocating-compressor combined are more efficient than either apparatus alone, exactly as the engine-turbine combination is more economical in the consumption of steam.

A turbo-blower supplying air compressed to 8 lb. to two reciprocating blowing engines would enable them to deliver as much air as three drawing air from the atmosphere, and the efficiencies which are guaranteed in the use of exhaust steam by the builders, combined with the guaranteed efficiency of the turbo, indicate that this can be done at a decided saving in first cost and with an efficiency certainly no lower, probably higher, than that of either unit alone. This does not make any allowance for the possibilities of spray intercooling between the turbo and the reciprocating compressors, which, in ordinary practice, would be good for about 4 per cent. additional saving at a very low cost.

The advantage of maintenance is undoubtedly with the turbo, as compared with reciprocating engines. At the same time the magnitude of the alternations of stress in the reciprocating engines is greatly reduced by delivering to them partly compressed air, and the problem presented by their inlet valve gear, which has given so many bad hours to both furnacemen and engine designers, is practically eliminated by delivering to them denser air under pressure.

It, of course, cannot be denied for a moment that the efficiency of the reciprocating machine as a compressor is far higher than that of the turbo, except for the lowest pressures, while the advantages of positive metering of the air by the reciprocating engine will cause furnacemen to accept the combined apparatus without that hesitation which they feel toward the non-positive turbo.

As long as all conditions remain constant the speed of the turbine will be unchanged, but if the pressure required by the furnace increases a little more steam is admitted to the steam engine by its governor, and this increased quantity of steam speeds up the turbine to a slight extent and so causes it to deliver air compressed to a slightly higher pressure.

Mr. Johnson concluded with expressing the conviction that the introduction of the turbo-compressor marks the beginning of a better era for the mechanical equipment of blast furnaces, but that its best and easiest application will be in conjunction with, rather than in supplanting, piston blowing engines. Incidentally, it may be stated that Mr. Johnson has received a patent lately covering the combination described.

Mr. Rice's paper also received special attention at the hands of C. J. Bacon and H. J. Freyn, of the Illinois Steel Company, South Chicago. Mr. Bacon regarded the shaft efficiency, so to speak, of the reciprocating blowing engine was 75.8 per cent., being the product of 94 per cent., the efficiency of compression, 89 per cent., the efficiency from a volumetric standpoint, and 90.4 per cent., the mechanical efficiency, as against 68 to 70 per cent. for the turbo compressor. Prof. Cardullo suggested the use of smaller valves on blowing engines—a large number of, say, 3-in. diameter valves of steel plate to overcome the troubles described in Prof. Trinks' paper.

Mr. Freyn referred briefly to numerous interesting figures being obtained for the United States Steel Corporation tending to indicate conclusively the value of gas driven blowing engines. He said, for example, that in a plant of four furnaces of 500 tons' capacity eight blowing engines might be installed, six for use and two for spare, or six turbo-compressors, four for use and two for spare.

The gas blowing engine is in the lead with coal at $1.80 per long ton, but where coal costs nothing the turbo is ideal. Julian Kennedy and he took issue on submitted comparative figures, but it is felt wise to withhold publication of these until they can be offered with a greater degree of authenticity than is possible under the present circumstances. It was explained also in the discussion that the Westinghouse Machine Company had been doing considerable experimental work in this direction, and the impression was gained that shortly one should expect to receive definite information of a type of blower the pressure-volume characteristics of which indicate a stability calculated to make it an efficient and valuable apparatus, particularly for parallel operation.

The Steam-Hydraulic Forging Press

A paper on power forging, with special reference to steam-hydraulic forging presses, by Berthold Gerdau and George Mesta was read by Mr. Gerdau, who hails from Dusseldorf, Germany, and whose presence added to the interest of his lantern-slide explanation of the paper. The paper compared the forgings produced by hammering with those produced by pressing and illustrated features of various steam-hydraulic presses. The discussion of the paper, like that of others of the papers, had to be cut short and was mainly to the point that in comparing the two general types of forging machines the time factor must enter, that with the hammer the maximum force is exerted at the starting of the work and gradually lessened, while with the press maximum pressure is reached at the end of the period of a given effort of the press. It was felt unjust to compare the two types of forging without taking into account such factors as the composition and temperature of the material being worked.

View in the National Works of the National Tube Company, McKeesport, Pa.

EXCURSIONS, ENGINEERING AND OTHERWISE

Many of those who arrived before Tuesday evening took advantage of the opportunity of visiting the exhibit of foundry equipment at the Exposition Building, which had been continued beyond the close of the American Foundrymen's convention of the week before so that the engineers might inspect it. The first regular excursion of the convention was that to the

Universal Portland Cement Company's Works at University, Pa. This trip was taken Wednesday afternoon by special train, luncheon being served on the train. Arriving at the works the party was divided into groups and conducted through the plant by guides furnished by the company. This company manufactures Portland cement, using granulated blast furnace slag obtained from the Bessemer furnaces of the Carnegie Steel Company, and limestone, which is quarried near Butler, Pa. The capacity of the plant is 3,500,000 bbl. per year. The company, a subsidiary of the United States Steel Corporation, also has plants at South Chicago, Ill., and at Buffington, Ind., making a total capacity of 12,000,000 bbl. per year. In the local plant the power is furnished by induction motors supplied with current from the gas power plant at the Carrie furnaces of the Carnegie Steel Company.

Returning to the train the party proceeded to East Pittsburgh, where the works of the

Westinghouse Electric & Mfg. Company and the **Westinghouse Machine Company** were visited. The former employs 14,000 people and has 50 acres of floor space under one roof. The products cover a wide variety of electrical appliances, from heating devices for domestic and commercial use to large electric locomotives, including generators, ¾ to 10,000 kw.; motors, 1/100 to 3000 hp., and transformers, 10 to 7,500,000 watts. The Westinghouse Machine Company employs 2150 men and occupies 12 acres of floor space. Its products are steam engines, 5 to 300 hp.; steam turbines, ¾ to 15,000 kw.; gas engines, 10 to 4000 hp.; anthracite and bituminous gas producers; Le Blanc jet and barometric condensers, and air pumps; Roney mechanical stokers, and the Melville-McAlpine turbine reduction gear.

National Tube Company.—Thursday afternoon was reserved for a visit to the National Works of the National Tube Company at McKeesport. Special trolley cars carried the visitors over the picturesque hilly country to McKeesport, and after the carefully planned walk through the works, for which a map and guides had been provided, the return journey to Pittsburgh was made on the Monongahela River by a boat on which the ladies were being entertained. The works are a little over a mile in length and cover about 100 acres. Tubular goods, both butt and lap weld, from ⅛ in. to 30 in. in diameter, are manufactured from the iron ore, the works including four blast furnaces and accessories. The tube and pipe mill building proper is approximately 1600 ft. long and 600 ft. wide, covering 23 acres, and is said to be the largest building in the world under one continuous roof. The accompanying half-tone engraving will give an idea of the structure, but the different furnaces are sufficiently far in the background to make it inconvenient to attempt to explain the steps in the interesting process or to indicate the compact arrangement of the 12 lap-weld furnaces and six butt-weld furnaces in the building.

On Thursday evening was held the formal reception and dance, which took place in the Hotel Schenley.

On Friday afternoon, following the steel works session of Friday morning, a large party went to the Duquesne works of the Carnegie Steel Company, and a still larger party went to the works of the Mesta Machine Company at West Homestead. Special booklets and special transportation facilities were provided for both these trips.

Duquesne Works, Carnegie Steel Company.—The visit to the Duquesne works, with its 181.5 acres of ground area, its 9.31 miles of narrow-gauge and 37.56 miles of standard gauge works' railroads and its six gigantic blast furnaces, was specially interesting in the opportunity to see the blast furnace gas purifying system and the four 3600-hp. blast furnace-gas blowing engines, as well as two 2000-kw. gas-driven electric generating units in one of the power stations. The open-hearth plant, the rolling mills and the merchant bar department were inspected in turn.

Mesta Machine Company.—The visitors to the Mesta works had the advantage of seeing at one and the same time a model industrial establishment, with its steel, brick and concrete fireproof buildings, the steam-hydraulic press for forging work, discussed at the Friday morning session, and a large amount of work of gigantic size being turned out. The principal product of the works is machinery for steel mills, blast furnaces and power plants, including gas and steam engines, air compressors, rolls and gears up to 24 ft. in diameter.

A smoker and entertainment, given by the Engineers' Society of Western Pennsylvania, on Friday evening, at the Union Club in the Frick Building, closed the Pittsburgh meeting. The central feature was a humorous address by George H. Neilson on "A Near History of Crucible Steel." Brief addresses were made by E. M. Herr, chairman of the local committee; Elmer K. Hiles, secretary, and by President Meier and Secretary Rice, of the American Society of Mechanical Engineers, and others.

The entertainment of the ladies was complete. It included visits to institutions of national reputation and extended automobile trips. The boat excursion on the Monongahela River has already been referred to. The ladies' committee was headed by Mrs. Chester B. Albree.

In connection with the gas power section a booklet containing an abridged description of the principal gas power installations in the Pittsburgh district and of the Pittsburgh natural gas supply and government producer experiments was issued. It gave data of permanent value whether the different plants could all be visited or not. In addition to this was prepared a handbook of the meeting, calculated to describe Pittsburgh in points of its historical and engineering attractions. It comprised 56 pages of illustrations and descriptions and maps of Pittsburgh and the Pittsburgh district.

The Corrosion of Iron*

The Influence of Impurities

BY JOHN W. COBB, FARNLEY, LEEDS.

To the working metallurgist iron is not a chemical unit, but declares itself unmistakably a complex in every sample under the microscope. A study of the corrosion of iron may therefore be specially directed to the influence of its various and visible components, with a prospect of obtaining interesting and useful results. The conditions of rusting in any metal fall into the following categories:

1. The initiation of the corrosion of a pure metal, such as a (hypothetically) chemically, physically and electrically homogeneous iron, in a pure and homogeneous medium, such as pure dry air or pure water.

2. The initiation of corrosion of a pure metal in a medium not pure or not homogeneous, such as pure iron in ordinary air, water or both.

3. The initiation of corrosion of an impure metal in a pure medium, such as commercial iron in pure water or pure dry air.

4. The initiation of corrosion of an impure metal in an impure medium, such as commercial iron in ordinary air or water, or both.

In each case another set of conditions arises, not necessarily the same, or even similar, as those of the continuance of corrosion after initiation. The number of sets of conditions is evidently large, and a complete solution of the problem difficult. Thus the work of W. H. Walker, J. N. Friend and Lambert and Thomson, to mention some of the most recent investigations only, has shown how difficult it is to come to a final conclusion as to whether water without carbon dioxide corrodes iron, although it may be said to be generally admitted now that carefully prepared pure iron and water interact, if at all, to a minimal extent.

The author, who accepts the "electrolytic" views, has limited his inquiry to the influence of the various impurities of commercial iron on corrosion, any constituent other than iron being termed an impurity. For this purpose the very useful "ferroxyl" indicator of Walker and Cushman was employed, and a study was made of the following:

1. The color and electrical effects between iron and separate impurities, such as sulphides, phosphides and silicates.

2. The same effects between iron and steel pieces in electrical communication.

3. The behavior of iron, steel and impurities together and separately in the ferroxyl indicator as disclosed by observation under the microscope.

The indicator was made by neutralizing an aqueous solution of gelatin, which would just set on cooling, with caustic soda, and adding a little potassium ferricyanide and phenolphthalein.

A Summary of Results

The work may be summarized thus:

1. The results are interpreted on the electrolytic theory of corrosion as elaborated by W. H. Walker, Cushman and others. Thus the initiation of the corrosion of iron is regarded as depending on the actual contact of pure iron and a conducting impurity immersed in or connected by an electrolyte, which may be only a thin film. Continuance of corrosion necessitates further the escape or oxidation of the polarizing film of hydrogen, and also that the iron compound formed by initial corrosion on the metallic iron should not be an impervious and non-conducting covering.

2. Pure iron is definitely electro-positive to most of its impurities; that is, a current is found to flow through the liquid from iron to impurity, the iron going into combination with some substance in the liquid, and the impurity remaining undissolved. Among such impurities were found phosphide, sulphide, carbide, oxide and silicate of iron. With carbon (graphite) the effects were particularly marked. All the iron alloys tried (except ferromanganese) were also electro-negative to pure iron.

3. With the sulphide and silicate of manganese little or no current flowed, because both were non-conducting. Manganese and 80 per cent. ferromanganese were found definitely electro-positive to iron, manganese going into solution, while iron remained undissolved.

4. Every piece of commercial iron showed electrical effects with any other, and the effects between portions of the same piece were always sufficient to induce corrosion when the other conditions were satisfied.

5. Microscopic examination disclosed the same general action before noted as occurring between iron and its impurities; the iron went into solution around the impurity. Manganese sulphide on iron went into solution, and the iron also, while with manganese silicate and iron neither was attacked. Manganese and ferromanganese went into solution on iron, which was unattacked ,and even preserved.

6. The presence of an impurity determines so many corrosion centers for iron, and so its influence depends more on quality and distribution than quantity: thus a more homogeneous iron, even if chemically less pure, may be more highly resistant to corrosion.

7. Certain rapidly appearing corrosion centers in all irons examined were not visibly related to impurities recognized under the microscope.

*Presented to the Iron and Steel Institute, London, May 10-11, 1911.

That illuminating engineering service is a recognized assistance which those investigating artificial lighting may be expected to look for is indicated by the joint announcement of the Westinghouse Lamp Company, Bloomfield, N. J., and the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., that Norman Macbeth has been placed at the head of a new department for the companies, the illuminating engineering department, for consultation and for issuing plans and specifications for lighting projects.

Automatic Temperature Controlling Instrument

A New Device for Hardening and Annealing Furnaces

BY E. F. LAKE, BAYONNE, N. J.

The natural growth of machinery and machine tools has created a demand for finer and finer work as time progressed. Thus we find to-day that pieces must be made within 0.001 in. of the correct size that some years ago were good enough if they were within 0.03125 in. of size. This difference in the quality of the various parts has resulted in a demand on the hardener for better and closer work.

To get the work closer to size and truer to shape in the hardening room has created a demand for furnaces and instruments with which the work can be done. Where a few years ago the forge fire was considered the only essential for a hardening room, to-day we have muffle, oven, revolving retort, lead and salt baths, hardening, annealing and tempering furnaces; hot plates, etc. These are heated with fuel oil, gas and electricity, and have various kinds of pyrometers or other instruments for measuring, indicating and recording their temperatures.

With all of the improved apparatus, however, it has been difficult heretofore to keep the temperature of the furnace, in which the steels are heated within many degrees of the correct one for hardening. When done it required the constant watching of the valves and the burners by the operator, and a continual turning of them to regulate the heat properly and hold it at the desired temperature. This was usually all one man could do while watching the heat indicated by the pyrometer.

After spending many years investigating, experimenting and testing, the American Gas Furnace Company, Elizabeth, N. J., has perfected and placed upon the market an instrument that will automatically control, within 5 deg. either way from the desired temperature the heat of any furnace using gas for fuel. While this statement may appear simple on its face, a great deal of experimental work had to be done before an instrument that would operate correctly was developed. Many have attempted the feat, but the various instruments that have been designed by others have retarded the action of the pyrometer indicator, and consequently destroyed the correctness of its readings. This new instrument has overcome all of the troubles encountered by others by using a mechanism that is very ingenious. Even though it appears complicated and delicate, its design and the principle on which it works are such that the various parts have no cause to wear quickly or get out of order. In no way does it retard the travel of the indicator pointer of the pyrometer, to which it is attached.

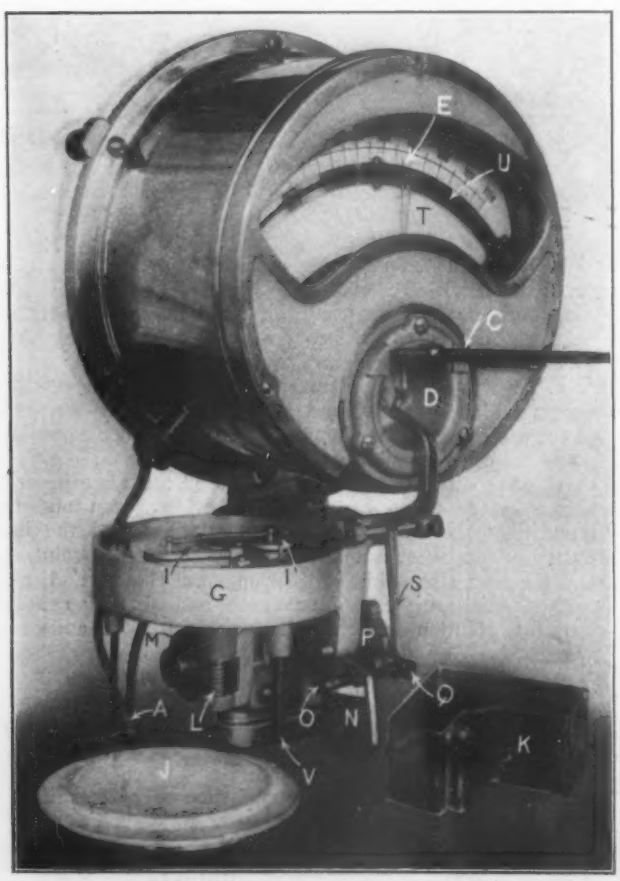


Fig. 1.—The Operating Mechanism Attached to the Pyrometer Indicator.

In designing this instrument several conditions had to be met. First, it was found that for accurate control it was necessary to have a fire end and pyrometer with which to indicate the heat. The pointer on the dial must, therefore, be the objective point on which to start the design of the instrument. As this continually travels back and forth with the rise and fall of the temperature inside the furnace, it was rather difficult to devise a way to make it operate a mechanism that was strong enough to open and close the gas and the air valves through which the fuel passes to the burners that supply the heat to the furnace. This must be done to increase and decrease the heat when necessary, and it must be done without retarding the action of the pointer. To retard it would ruin the instrument by making the temperature readings unreliable.

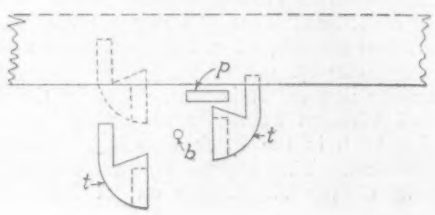


Fig. 2.—Sketch Showing Movement of Arm Extensions.

That this has been successfully accomplished will be plainly seen by a close examination of the mechanism of the instrument, which consists of two separate and distinct parts. One of these is attached to the pyrometer indicator, as shown in Fig. 1, and the other to the furnace. In action, it opens and closes ports that either turn a current of compressed air into the atmosphere or allow it to flow to the second part, which is attached to the furnace, as shown in Fig. 5. As it is necessary to have an air supply to run furnaces of this kind, it can easily be piped to the instrument, and with very little cost.

In Fig. 1 the wires shown at A connect the thermocouple or hot end to the pyrometer indicator. By turning the knob B, Fig. 4, the threaded end C, Fig. 1, of the rod is operated and revolves the cup D to make the pointer E point to the temperature at which it is desired to hold the furnace for hardening the work.

Power is obtained to operate the instrument through a current of air that enters from the back of the instrument and passes through the port F, Fig. 3. This enters the chamber G, strikes the blades of the turbine H and causes it to revolve, its speed being controlled by two governors, I. The cover J and the oil pan K were removed in Fig. 1 to show the operating mechanism better. When the air revolves the turbine H, Fig. 3, it also rotates the worm L, which is attached thereto, and this in turn revolves the worm gear M. This moves the piece N in and out as its inner end is fastened to the far end of the shaft on which the worm gear M is located. The piece N forces out the rod O, and this simultaneously turns the two cams P partly over and moves out the rod Q. The two cams are attached to each other, and this movement reverses the action of the arms S: *i. e.*, stops the arm that has been oscillating and sets in motion the opposite one. The rod Q slides back and forth in the opening R and this movement

opens and closes ports that allow the current of air to either pass into the atmospnere or into the part of the instrument that is attached to the furnace, Fig. 5. It thus furnishes the power to open and close the gas and the air ports. Of the two arms S, Fig. 3, that ride on the cams P, one is constantly oscillating in and out by its lower end

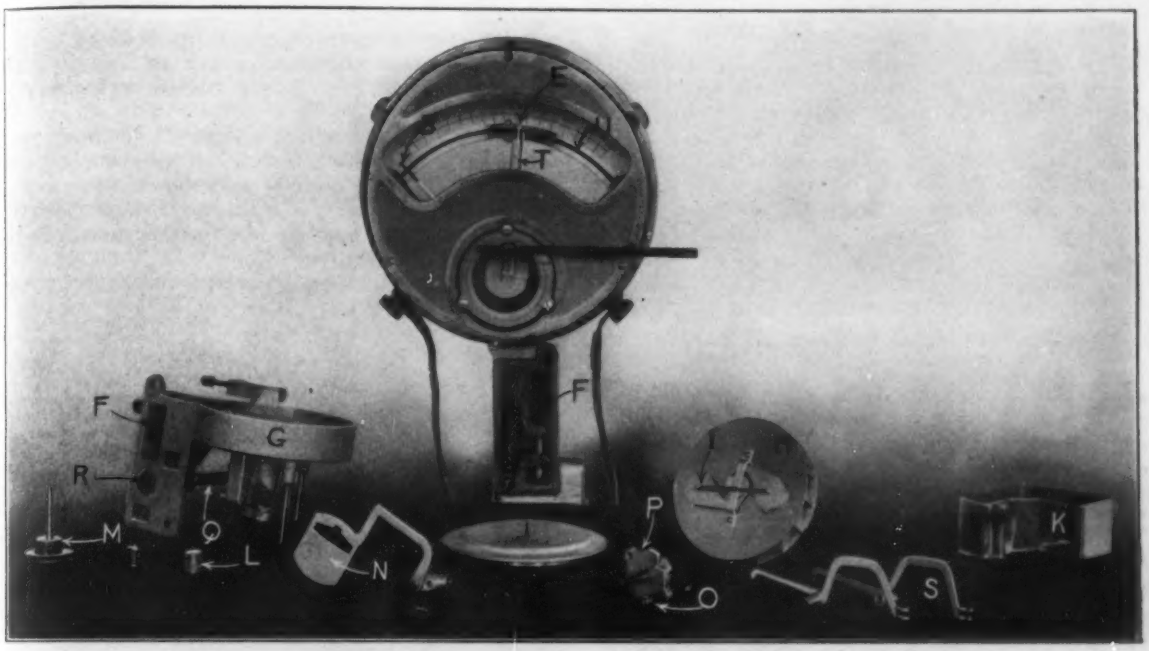


Fig. 3.—View of the Various Parts of the Operating Mechanism.

entering and leaving the depression in its respective cam. When starting the furnace the right-hand arm extension T is the one that oscillates in and out of the slot U on the indicator dial. The oil pan K fits on the pin F and covers the worm and worm gear so that these may be kept running in oil by filling the pan K.

The Operation of the Instrument

In starting up the furnace the gas and the air valves are turned on full and the temperature starts to rise. The left

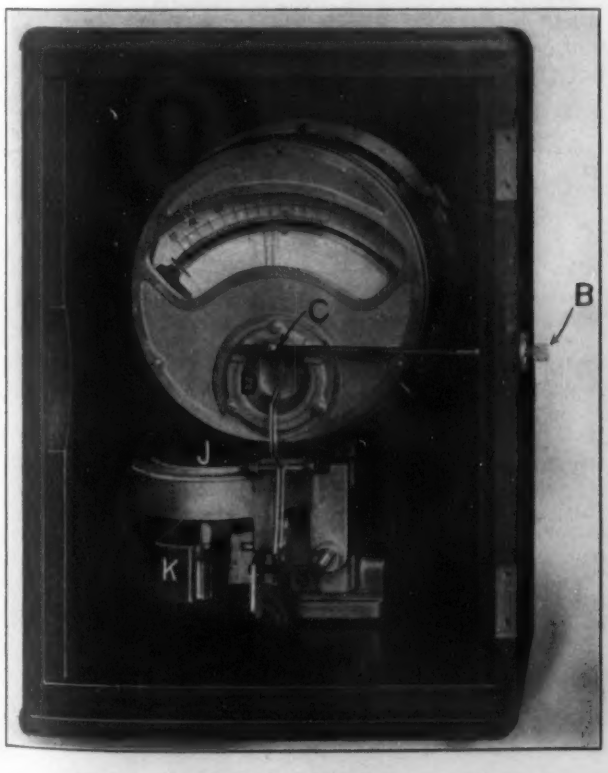


Fig. 4.—The Mechanism Assembled in the Case.

arm extension *t* is then stationary in the position shown Fig. 2, which is a view looking down on the instrument from above. When in motion it has the range shown from that position to the one indicated by the dotted line. The right arm extension also has the same range of motion and is oscillating in and out of the slot in the indicator dial. When the temperature has risen sufficiently for the indicator pointer *b* to reach the position shown, the right arm extension *t* presses the indicator pointer against the dial, as shown. This trips and throws the cam *p* over to a different position. The cam then forces the right arm extension out to the stationary position shown by the left arm extension and starts the latter oscillating.

Tne gripping of the pointer is only momentary, and when the arm extension is thrown back to the stationary position it leaves the pyrometer pointer free to travel to the right and take care of any lag that occurs. This motion also transmits power to the lower part of the apparatus and thus closes the gas and the air ports that supply fuel to the furnace for heating. As the furnace cools the indicator pointer *b* travels backward to record

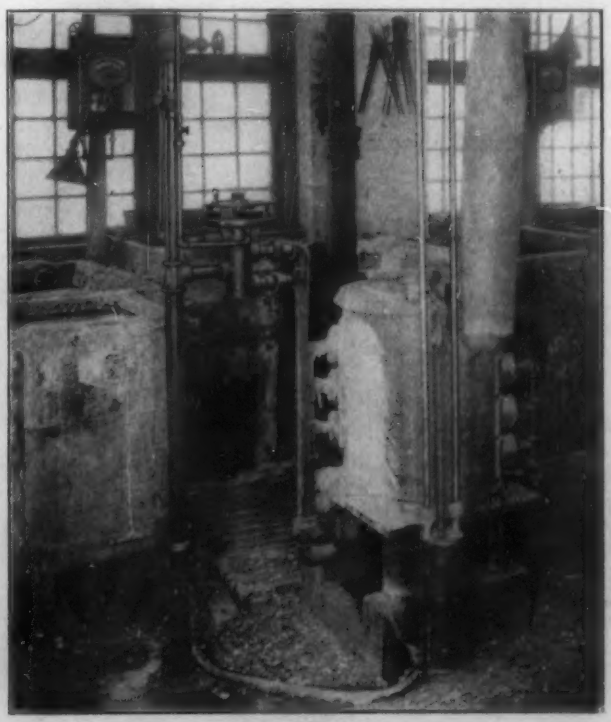


Fig. 5.—The Operating Mechanism Installed in Connection with a Furnace.

the lower temperatures, and in so doing left arm extension *t* will grip it, trip and move back to the stationary position and the right arm extension *t* will start oscillating.

Thus it will be seen that there is no retardation of the

action of the pyrometer indicator B, Fig. 3, as the arms merely grip it against the dial for an instant and then release it. This instant of gripping throws the switch

Fig. 6.—The Dial and the Pointers of the Mechanism.

that turns the gas and the air on and off and either reduces the temperature in the furnace or raises it. By this action it is very easy to control the temperature within a range of 10 deg. F. or within 5 deg. either way of the required temperature and maintain the furnace temperature constant at this point throughout the day.

The above described movements of the instrument open and close ports that control an air current that passes from this part of the instrument through a ¼-in. pipe, A', to the lower part shown in Fig. 5. The air coming through this pipe enters a diaphragm located in the casting V and raises a sleeve in the cylinder W. This sleeve contains ports opposite each gas and air inlet, and these are opened when the sleeve raises. When the air current is shut off from above the sleeve drops and the ports are closed. The distances that the ports can be opened and closed are regulated by levers, X. The dial on which these levers move and the levers are best shown in Fig. 6.

These levers merely open or close the space in which the pin Y, Fig. 5, travels by screwing the rings, to which they are attached, up or down on the threaded hub. This pin is attached to the sleeve that operates in the cylinder

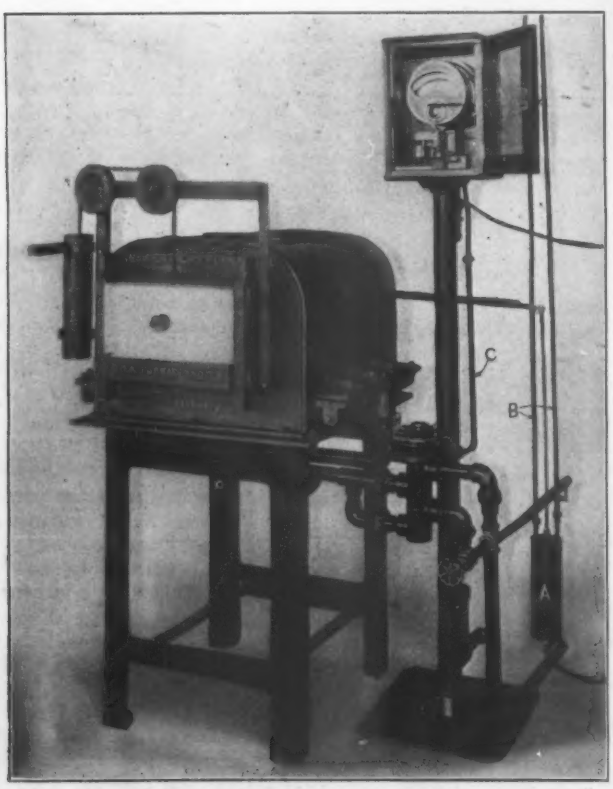


Fig. 7.—The Complete Instrument Connected to a Furnace and Ready to Operate.

W, and contains the ports that shut off or admit the gas and the air. Thus the maximum distance that the ports can be opened is reached when the pin Y strikes the upper ring and the minimum distance when it strikes the lower one. The position in which these levers X are usually placed when holding a furnace at a hardening temperature of about 1450 deg. is shown by their position in Fig. 6. The pointer Z is merely used to show the position at which the lever on the lower ring was set, so that the furnace may be shut down and started up again the next morning without any experimenting. The lever X that is located at the pointer Z registers the lowest point of the opening of the ports in the sleeve in the cylinder Y, Fig. 5, while the second lever X is turned to register the maximum opening.

In Fig. 7 the complete instrument is shown as it is attached to a furnace that is set up ready to operate. The door of the pyrometer indicator is thrown open to get a better view of the mechanism. This door is provided with a key, and thus the instrument may be set at

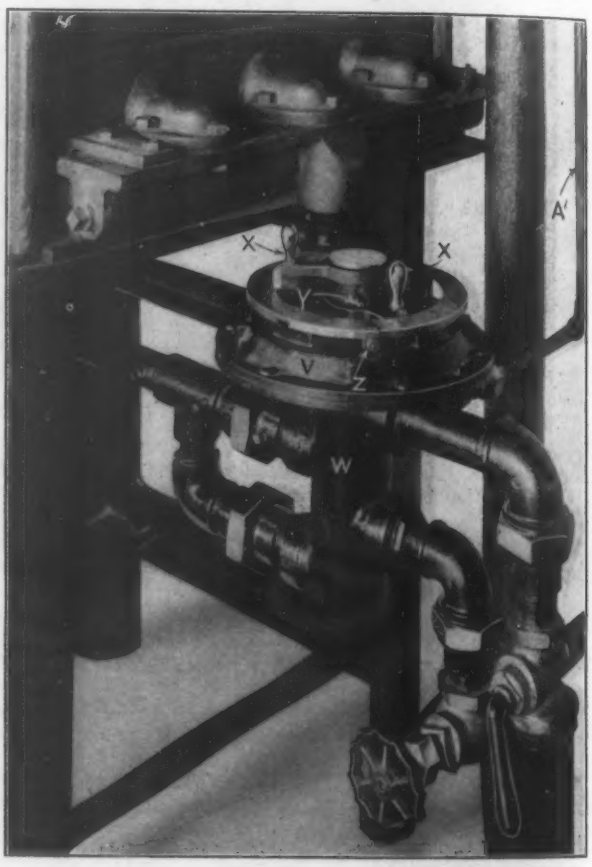


Fig. 8.—Two Instruments in Daily Use for Over Two Years at the Plant of the American Swiss File & Tool Works, Elizabeth, N. J.

any temperature and the door locked so it will not be tampered with or changed until the work being heat-treated in the furnace requires a change. The fire end and the indicator are of the Bristol type of pyrometer. The wires from the fire end are run through the tank A, in which a circulation of cool water is maintained by the pipes B. This cools the wires and prevents any heat from traveling along them from the furnace to the pyrometer indicator and thus give a false reading. The pipe C is the one through which the air travels from the indicator mechanism to the diaphragm to operate the slide valve for gas and air. After the valves have once been opened to supply the furnace and the instrument with the necessary power and fuel it is not necessary to touch them again, as the instrument automatically turns, both the air and the gas, off and on when it is necessary. The only reason, therefore, for touching the globe valves would be for making any necessary repairs.

Results in Service

Before placing these instruments on the market the American Gas Furnace Company placed three in the American Swiss File and Tool Company's plant at Elizabethport, N. J. Two of these have been in daily use for hardening files, and the hardeners say they would not know how to get along without them. It has greatly reduced the losses caused from non-uniformity in the harden-

ing temperatures, and it is possible to obtain a much more uniform product in the run of 1000 dozen files. In this case one man hardens many dozens in a day and a uniform temperature throughout the day is of vital importance, as each file must be the equal of any of the others.

On some of the thinner files it has been found that a variation of 10 deg. in the hardening temperature would cause the file to be thrown out as useless. This is due to the fact that too high a temperature would cause them to be very brittle and break. Owing to their thinness the high temperature would not leave the center as soft as would make it tough enough to withstand the strains put upon it, while too low a temperature would not give the edge of the teeth a hardness that would withstand the cutting strain put upon them. Before attaching and using the temperature regulating instrument some 130 dozen files in a lot of 1000 dozen were thrown out and condemned, while after the instrument was put in the losses were reduced to about six dozen per thousand dozen.

In the hardening of any piece of which duplicate parts are made it can readily be seen that an instrument of this kind is very applicable and had been badly needed for some time. With it the pyrometer can be set to a certain temperature for the day's work of hardening, the furnace heated up to that temperature, and after this, the hardening can be started with the assurance that the temperature will remain constant unless the fire end gets out of order or something breaks down.

Since putting the instruments in the file works it has been improved somewhat, and the instrument shown in Fig. 7 is slightly different from those in Figs. 8 and 9. The principles on which they operate are the same, however, and one would have to have the instruments side by side to see the difference between the one shown in Fig. 7 and that in Fig. 8.

In Fig. 9 is shown an instrument that has been connected up to two annealing furnaces. To use it on either furnace it is only necessary to change the fire end, with its water cooling tank. This instrument has been in use for three years, and is the first one of the kind that was made. It has proved very successful, however, and has been in constant use since it was installed, and even though the instrument may appear to be delicate this one has never been repaired in any way, and stands to-day just as it did when it was installed.

It would not be much of a task to attach a clock movement to the threaded rod C, Fig. 1, which sets the pointer E to the temperature desired in the furnace, and thus gradually lower the temperature to make the annealing furnaces slow cooling. This could be regulated to cool the furnace off as slowly or quickly as desired. One of the greatest needs in the heat treating of steel is a reliable slow cooling annealing furnace that will work entirely automatically. With a clock arrangement attached to this instrument it would seem to be the ideal mechanism for that purpose. Many uses can also be found for the instrument on hardening and tempering furnaces as well as annealing, and in view of the fact that absolute accuracy is required in all heat treating operations it is, no doubt, a fact that this instrument, or instruments of this kind, will be much more used in the future.

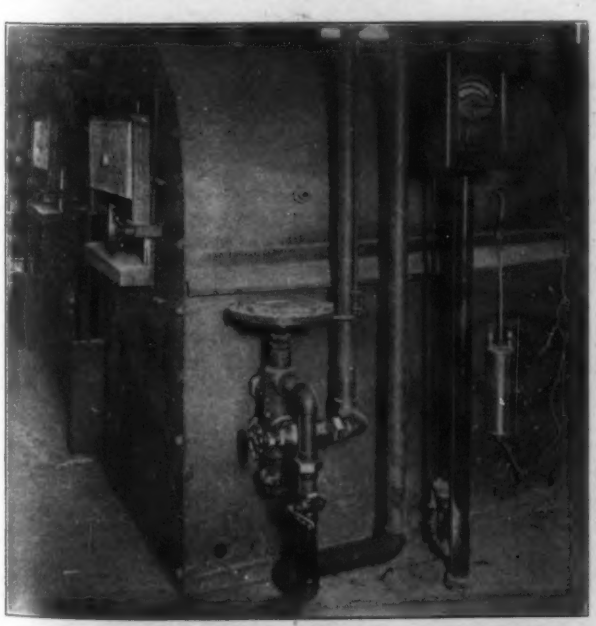


Fig. 9.—An Installation of the Instrument in Connection with Two Annealing Furnaces.

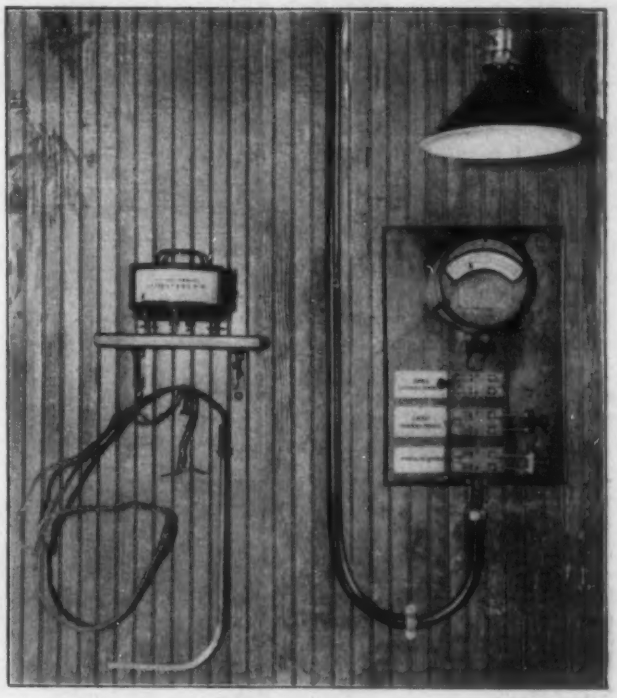


Fig. 10.—The Indicator Used in the Office.

That it does not in any way complicate or prevent the operation of pyrometers of different makes is shown by the apparatus in Fig. 10. The instrument to the right under the incandescent lamp is a pyrometer indicator that is wired to the lead-hardening furnaces and annealing furnaces shown in Figs. 8 and 9. This is located in the superintendent's office at some distance from the furnaces, so that the superintendent may always know what temperature the different furnaces are running at by merely throwing in the switch that connects it to the individual furnace to be inspected. In this case the switch for the small hardening furnace was thrown in and the pointer indicated the temperature at which it was then running, namely, 1450 deg. F. The instrument to the left is a Thwing pyrometer that is used for testing the other pyrometers to see that they are indicating properly. This is carried to the various furnaces and the hot end, shown hanging on a hook under the pyrometer, is inserted in each furnace to get its temperature and compare it with the one attached to the furnace.

Russian Pig Iron Soaring.—According to Consul John H. Grout, Odessa, Russia, information received from Nicolaief is to the effect that the recent organization of the syndicate to control the pig-iron market in South Russia is being seriously felt by consumers, all being short of raw material. Prices of pig iron have advanced to what is considered to be an absurd price. Where the former quotation was 22½ cents per pood (36 lb.), equal to $14 per ton, present prices have reached 51½ cents, or $32 per ton, and even at this price it is very difficult to obtain deliveries on time. It is stated that the members of the syndicate are storing up large quantities of pig iron to further enhance prices. On account of advanced prices of raw iron, those for agricultural implements have been raised all along the line. To counteract this condition of affairs, owing to the intercession of manufacturers interested, it is said that the government authorities contemplate admitting 10,000,000 poods (160,000 tons) of foreign pig iron at reduced rates of duty.

The Long Island Hardware Company has been incorporated with a capital stock of $25,000 to conduct a wholesale business in factory, contractors' and railroad supplies at 71-77 Jackson avenue, Long Island City, N. Y. F. A. Scholl, formerly with Topping Brothers, New York City, is president and treasurer, and the secretary, C. F. Williams, was formerly connected with John W. Petrey, of Long Island City.

By-Product Coke Ovens in America

The following list of by-product coking plants, compiled by the United States Geological Survey, is believed to embrace practically all that have been installed to date in the United States and Canada:

	No. of ovens
United-Otto	
Lackawanna Steel Company, Lackawanna, N. Y.	*564
Camden Coke Company, Camden, N. J.	50
Carnegie Steel Company, South Sharon, Pa.	212
Cambria Steel Company, Johnstown,	312
Maryland Steel Company, Sparrows Point, Md.	200
Hamilton Otto Coke Company, Hamilton, Ohio	50
Citizens' Gas Company, Indianapolis, Ind.	50
Michigan Alkali Company, Wyandotte, Mich.	30
Zenith Furnace Company, Duluth, Minn.	50
Otto-Hoffman	
Dominion Steel Corporation, Sydney, N. S.	500
New England Gas & Coke Company, Everett, Mass.	400
Camden Coke Company, Camden, N. J.	100
United Coke & Gas Company, Glassport, Pa.	120
Cambria Steel Company, Johnstown, Pa.	60
Lackawanna Iron & Steel Company, Lebanon, Pa.	232
Hamilton Otto Coke Company, Hamilton, Ohio	50
Semet-Solvay	
Solvay Process Company, Syracuse, N. Y.	40
Empire Coke Company, Geneva, N. Y.	46
Dunbar Furnace Company, Dunbar, Pa.	110
Suburban Gas & Electric Company, Chester, Pa.	40
F. H. Buhl Coke Works, Sharon, Pa.	25
Pennsylvania Steel Company, Lebanon, Pa.	90
Pennsylvania Steel Company, Steelton, Pa.	120
National Tube Company, Benwood, W. Va.	120
Tennessee Coal, Iron & Railroad Company, Ensley, Ala.	240
Central Iron & Coal Company, Tuscaloosa, Ala.	40
By-Products Coke Corporation, South Chicago, Ill.	200
Milwaukee Coke & Gas Company, Milwaukee, Wis.	160
Solvay Process Company, Delray, Mich.	132
People's Heat & Light Company, Halifax, N. S.	10
Rothberg	
Lackawanna Steel Company, Lackawanna, N. Y.	282
Lackawanna Iron & Steel Company, Lebanon, Pa.	5
Retort Coke Oven Company, Cleveland, Ohio	105
Didier	
Lehigh Coke Company, South Bethlehem, Pa.	†300
Koppers	
Illinois Steel Company, Gary, Ind.	560
Illinois Steel Company, Joliet, Ill.	280
Von Bauer	
Nova Scotia Steel & Coal Company, Sidney Mines, N. S.	30
Bernard	
Nova Scotia Steel & Coal Company, Sidney Mines, N. S.	120
Total	6,035

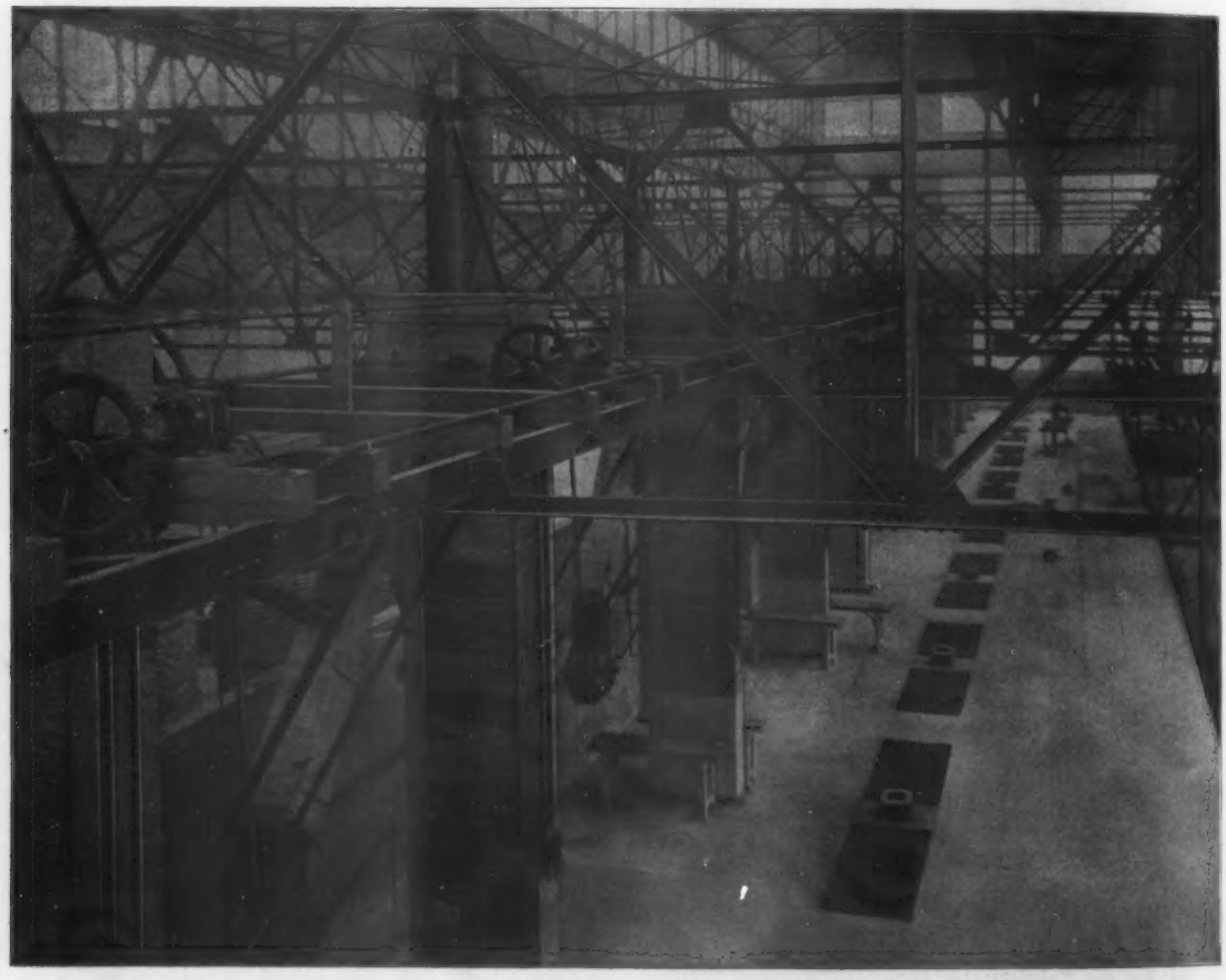
*Contracted for; 188 completed.
†Under construction.

Of the 13 plants of Semet-Solvay ovens in the United States, two are owned by the Solvay Process Company and the others are operated by the Semet-Solvay Company, the coke produced being turned over to the company whose name appears as owner. Tar and ammonia are recovered as by-products from all of the plants in the above table, except that of the Nova Scotia Steel & Coal Company.

Handling Sand in the Foundry

Sand Elevating Equipment to Hoppers Discharging to Molding Machines on the Foundry's Second Floor

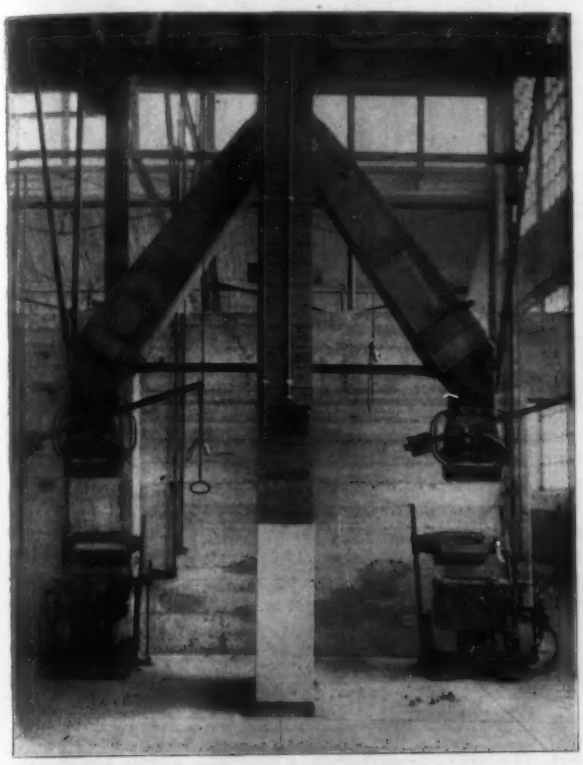
Molding machines located on what is substantially the second floor of the foundry, a sand handling floor underneath to which the sand is discharged after a heat and which is on a level with the yard; a system of elevators for lifting the sand and storing it for use in hoppers above the molding machines, describes briefly an unusually interesting equipment installed at Auburn, R. I., in the foundry of the General Fire Extinguisher Company. It represents an instructive study of the mechanical handling of material, and the elevators and incidental machinery were installed by the Jeffrey Mfg. Company, Columbus, Ohio.



View in Foundry of the General Fire Extinguisher Company, Auburn, R. I., Showing the Jeffrey Bucket Conveyors Delivering Sand to Molding Machines and the Floor Gratings Through Which Sand After Casting Is Dumped.

A part of the installation may be seen in the large halftone engraving, which shows nine of the seventeen bucket elevators, which lift the sand from the floor below to the hoppers. The remaining eight buckets are located at the right side and are not shown in the picture. Another view shows how each elevator discharges into a pair of sand hoppers, directly beneath the clamshell valves of which is located a molding machine in each case. The man operating these machines opens the valve, letting the necessary amount of sand drop by gravity to the machine, thereby not only cutting down the labor in the making of the molds but doing away with the loss of space ordinarily occupied by piles of sand on the molding floor.

The molding floor, as stated, is what may be termed the second floor of the building, as the first floor, or basement, is on the same grade as the surrounding yard, an



Molding Machine Sand Hoppers of System Installed by the Jeffrey Mfg. Company, Columbus, Ohio.

arrangement which allows for convenient carting of the molding sand. The molding sand from the yard is dumped in piles on the basement floor as indicated in one of the illustrations.

The operation of the system is briefly as follows: The sand on the basement floor is shoveled into the receiving

View in Foundry Basement at Foot of Sand Elevators and Below Molding Floor Gratings.

hoppers and the sand is elevated and discharged to the bifurcated hoppers above the machines. Each hopper has a capacity of about 1000 lb. of sand. The clamshell valves allow for regulating the discharge of the sand to the machine. Each elevator has a rated capacity of about 10 tons per hour and the power is applied to each elevator by a separate motor directly connected to the head by means of gears, as shown in the large engraving. While the elevators are incased with wood, the sand hoppers are of steel.

After the molds are complete, they are placed on the floor, and after the heat the castings are knocked out of the sand and the sand is dropped through the gratings in the molding floor, indicated in the large view. On reaching the basement, the sand is screened and tempered and ready to be elevated to the hoppers for use a second time.

It is learned from the Jeffrey Mfg. Company that a similar equipment has been supplied to the General Electric Company in its foundry at Pittsfield, Mass.

The Detroit Industrial Exposition.—The Board of Commerce of Detroit, Mich., is making elaborate preparations for an industrial exposition, which will be open from June 20 to July 6. Wayne Pavilion, the most spacious auditorium of the city, will be occupied, together with a temporary structure, covering adjacent property. A total floor area of 45,000 sq. ft. will thus be provided. The temporary hall is constructed of wood and staff, of attractive design. Detroit is one of the most interesting of the American industrial cities. The growth of its manufacturing business has been phenomenal, not only with the automobile builders and makers of automobile accessories, but in a large variety of other lines. The list of products is exceptionally varied. The directory of exhibitors has just been issued in an attractive pamphlet.

An American Sheet & Tin Plate Company Announcement

Consumers of black and galvanized iron and steel sheets are interested in an announcement made by the American Sheet & Tin Plate Company. This company has always discredited the accelerated acid test as a measure of corrosion, in which attitude it has been supported by the majority of sheet manufacturers, as well as by practically all eminent metallurgists; and this attitude it still maintains. The use of this test has grown in the last few years, and, notwithstanding the opinion of the large manufacturers and of eminent metallurgists, it is used to a great extent by railroad engineers, architects and others. To meet this special requirement, the American Sheet & Tin Plate Company has developed a material possessing all the good qualities of its famous Apollo best bloom and at the same time having the added qualification of fully meeting the accelerated acid test; or, more plainly speaking, being less soluble in acid than any iron or steel sheets heretofore placed on the market.

The accelerated acid test is presumed by many to be a direct measure of corrosion. In reality it is simply a measure of solubility of metals in sulphuric acid of a stipulated degree of strength, and it has been the contention of this company that no relationship existed between this test and corrosion under normal or atmospheric conditions. This acid test has been associated in the minds of many with, and apparently carried with it, the idea of exceptional purity; the usual metalloids being considered in this connection as impurities. The fact that this material possesses with it all the good features of Apollo best bloom is a strong recommendation of its efficiency to the discriminating purchaser.

The Ducharme Wrench & Machine Company, Cambridge, Ohio, has been delayed in completing its new plant, but indications point to the machinery being erected and ready for operation by the end of June. The company removed from Johnstown, Pa., to secure larger quarters for the manufacture of a patented pipe vise, pipe wrench, etc.

Combined Jarring and Squeezer Molding Machine

A new type of combined jarring and squeezer molding machine has been placed on the market by the A. Buch's Sons Company, Elizabethtown, Pa. The special features of it are simplicity of construction, ease of operation, no great installing expense and mechanical preparation of the molds. The field for which it is especially adapted is

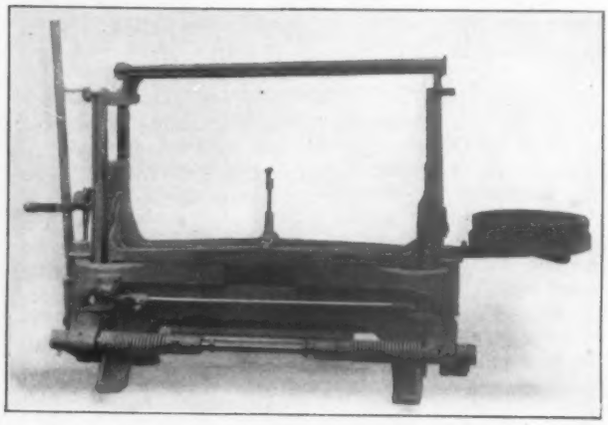


Fig. 1.—A New Type of Jarring and Squeezer Molding Machine Made by the A. Buch's Sons Company, Elizabethtown, Pa.

molding patterns for deep work, such as piston rings and other automobile parts. Fig. 1 is a general view of the machine, while Fig 2 shows the snap flask used with it.

The machine is very simple in construction and unskilled laborers can learn to operate it quickly and turn out molds usually made by hand on the bench rapidly. It is said that as the process of making the molds is entirely mechanical very accurate castings are secured. Combining the jarring or jolting process with the squeezing attachment does away with hand ramming even on deep flasks having irregular patterns. In addition to the making of deep patterns the machine is especially adapted for the ramming of deep, delicate green sand cores and on account of the jolting process it is impossible to ram off, something which is said to be very difficult to overcome on an ordinary machine of the squeezer type.

Either plate or loose patterns mounted in a composition can be used on the machine and the cope and the drag are made simultaneously. The degree of hardness of either part of the pattern can be varied to suit the requirements of any particular case. The molds are thrown from the machine in such a position that it is very easy for the operator to close them. In operating the machine he stands between them and in this way the exertion of bending over to close the molds is eliminated. No elaborate outlay is required to install the machine and it is simply necessary to place it on a level and hard foundation to utilize the full force of the jolt. Two sizes of machine are built, one handling any flask up to and including 12 x 18 in. and the other size accommodates a flask having maximum dimensions of 16 x 24 in.

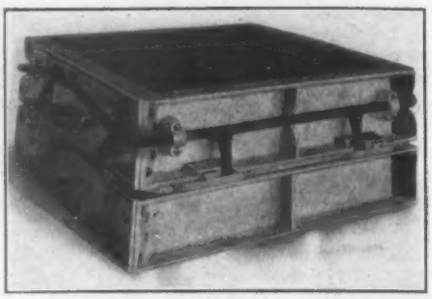


Fig. 2.—The Aluminum Snap Flasks Used with the Machine.

A special design of aluminum snap flask, which is shown in Fig. 2, has also been brought out for use in connection with the machine. These can be supplied either tapered and cast in one piece or as a straight hinged flask, which it is claimed will outlast at least 12 of the ordinary wooden pattern.

Combination Turret Lathe

New Warner & Swasey Machine Tool, Handling Both Bar Stock and Forgings

A new combination turret lathe designed to accommodate a wide range of bar stock work and also forgings is being brought out by the Warner & Swasey Company, Cleveland, Ohio. The builder has given this tool the trade designation of the No. 3A hollow hexagon turret lathe. It is claimed for the machine that it combines the highest development of a bar machine with the same standard of one employed for chucking work, and while it is intended to meet every requirement as a manufacturing tool of the highest class for either of these kinds of work, its range, capacity and equipment are such as to make it available for the economical production in small lots of a great variety of bar and chucking work. When equipped as shown in Fig. 1 bar stock up to 3⅛ in. in diameter can be fed through the automatic chuck and turned any length up to 36 in. at one chucking. With

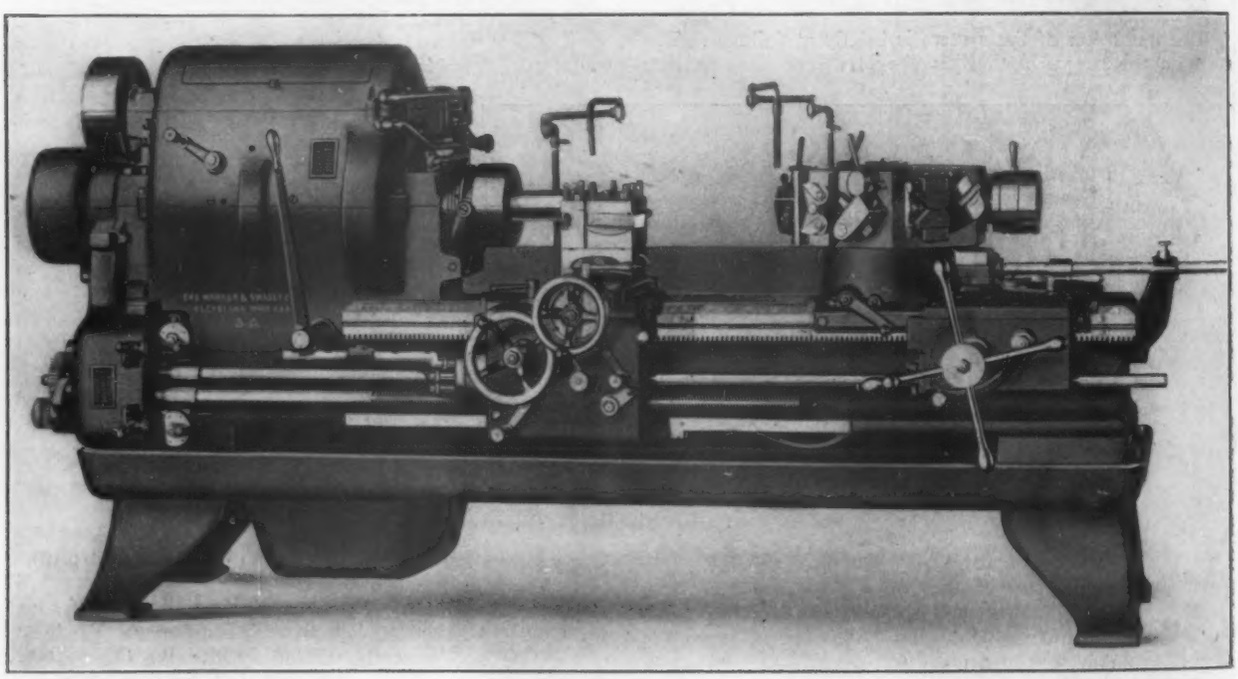


Fig. 1.—The New Combination Hollow Hexagon Turret Lathe with Single Pulley Drive and Equipped for Bar Work Built by the Warner & Swasey Company, Cleveland, Ohio.

the chucking outfit illustrated in Fig. 2 castings or forgings up to 15 in. in diameter can be handled. The swing over the bed is 23 in. and that over the carriage is 17½ in. This is a powerful machine of large capacity designed for the rapid, accurate and continuous production of duplicate parts.

Two important features in the design of this machine are the rigidity and the simplicity of construction of the entire tool and especially of the geared head. The machine is built with either the cone or single pulley drive, the latter being the type illustrated. The head and the bed are cast in one piece, insuring great strength and rigidity. The cone pulley head type of machine has a three-step pulley, the diameter of the largest step being 16¼ in., and is driven by a 4-in. belt. The single pulley drive machine is equipped with a 12-in. pulley having a face wide enough for a 4-in. belt. Two double friction clutches mounted on the back gear shaft give the spindle twelve speed changes in combination with the cone pulley ranging in approximately geometrical progression from 8 to 231 r.p.m., and in the single pulley machine the same speed range is provided. Three speed changes are obtained by sliding gears in the head operated by the small lever in front. These three speed changes are doubled by the two friction clutches on the back gear shaft, which are operated by the two lower levers to the right of the head. The upper lever operates the friction reversing clutch. The levers are so placed that they are within easy reach. The automatic chuck and the roller feed handle round, square and hexagonal bar stock. The chuck is operated by the long lever in front of the head, and this same lever also engages and disengages the power roller feed. A special design of chuck having a powerful and accurate grip and capable of holding short pieces is used.

The turret is of the hollow hexagon type, designed along the same lines as the other hollow hexagon turrets of this company and measures 16½ in. across faces. The locking bolt is located directly under the working tool and as far away from the center as possible. A stop for gauging the length of the stock is placed in one of the corners of the turret, which indexes automatically at this point, or not, as may be desired. The turret saddle has a long bearing on the V to insure its being well guided. The gear box provides ten automatic feed changes for the saddle in either direction, ranging in approximately geometrical progression from 0.1 to 0.0045 in. There are twelve independent adjustable stops, which are indexed with the turret and operate automatically. The backward movement of the saddle automatically indexes the turret.

The carriage is of the side carriage type and has bearings on the front V and the side guides only, the former being unusually long and wide. It is provided with a square turret for holding four single point tools, which can also be equipped with forming tools. The 15-in. chuck can swing clear of the carriage. The carriage has geared automatic longitudinal and cross feeds, each having the same number of changes and range as the saddle feed. The cross travel is 10 in. There are six independent adjustable stops for the longitudinal travel. The cross travel has one stop in each direction, and the cross-feed screw has a graduated dial equipped with six indicators. The square tool holder on the carriage can be indexed to four positions. The turret and the carriage have separate feed rods, so that the feeds are independent of each other, and both are provided with adjustable automatic trips. The feeds are alike for longitudinal and cross travel. Geared feeds insure a positive drive and any desired change is instantly obtainable by moving the levers in front of the gear box. The carriage is equipped with a lead screw for cutting threads of the ordinary pitches.

The machine is equipped with a wide and deep chip pan and an oil tank is cast solid to it. The oil is drained through a strainer over the top of the tank. A geared pump delivers a copious flow of oil to the cutting tools for both turret and carriage. The all-geared head machine can be belted direct to a constant speed motor. The floor space of the machine is about 11 ft. x 3 ft. 6 in.

The regular equipment consists of an outer stock support, an iron tool stand and complete bar and chucking outfits, including a 15-in. extra heavy geared three-jaw scroll chuck. A double friction countershaft is also furnished with each machine of the cone pulley head type. The pulleys on the countershaft are 16½ in. in diameter and have a 4½-in. face.

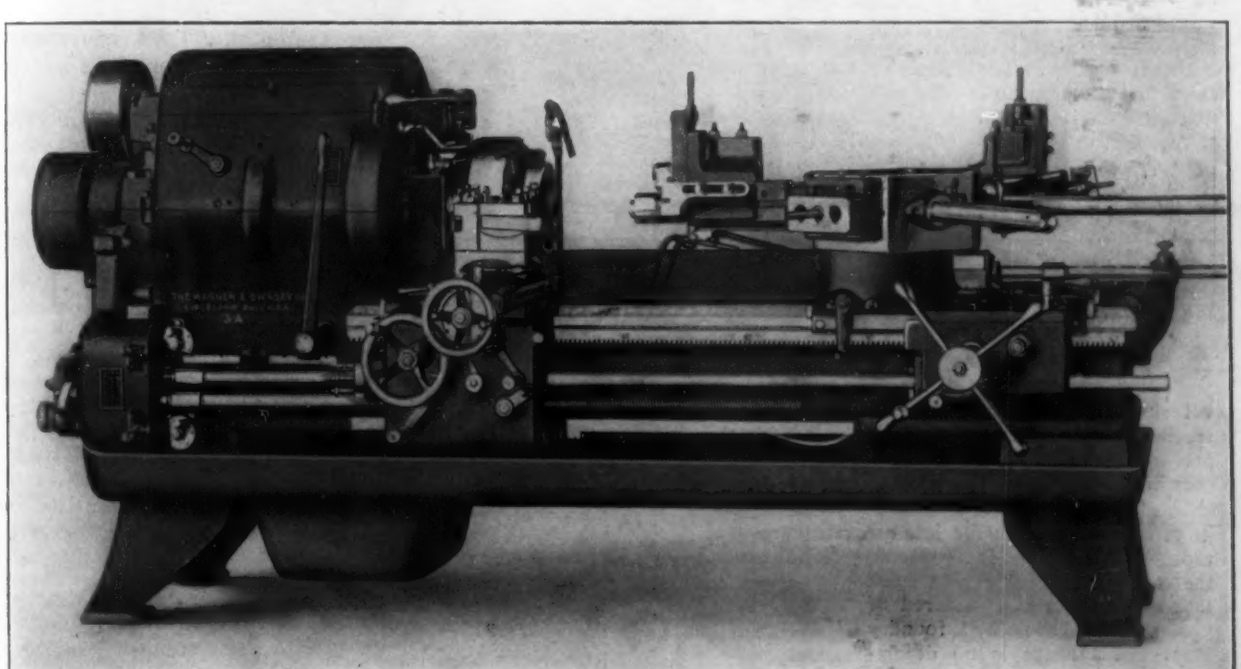


Fig. 2.—The Lathe Equipped for Chucking Work.

The Brown-Ketcham Iron Works Receivership.

The Brown-Ketcham Iron Works, Indianapolis, Ind., an important fabricator of structural material, has gone into the hands of a receiver in bankruptcy proceedings brought in the United States district court. Frank D. Stalnaker, president of the Capital National Bank, has been appointed receiver by the court. This action follows a suit previously brought in a state court by a preferred stockholder asking for the appointment of a receiver. The affairs of the company have for some time been in the hands of a creditors' committee, which was at work on a plan for protecting their interests and at the same time saving the company from failure. The assets are estimated at $1,000,000 and the liabilities at $550,000, not including the $350,000 preferred stock. The company states that its books do not show that the individual who brought the action in the state court is a preferred stockholder and will resist the litigation thus begun. The receiver has been ordered to continue operating the plant until the further order of the court, as the company has quite a number of contracts in hand.

Mechanical Charging of Cupolas*

Details of a Number of New Machines

BY GEORGE R. BRANDON, HARVEY, ILL.†

In a paper before the Pittsburgh Foundrymen's Association in March, 1908, the writer discussed the subject of charging machines for cupolas and described at that time the designs which had been developed by the Whiting Foundry Equipment Company, Harvey, Ill. In the interval since several types have been brought out to meet special operating conditions and these, with the designs previously referred to, will be illustrated and described, together with other equipment employed in handling charges.

Fig. 1.—An Electric Gantry Crane for Handling Raw Material in a Foundry Yard Built by the Whiting Foundry Equipment Company, Harvey, Ill.

It is evident from the interest aroused in methods for reducing the cost of handling cupola stock that this subject is considered of great importance by foundry managers. There is no department in the foundry in which greater returns will result from the adoption of a scientific plan of operation. Every movement, from the time stock arrives in the yard until it is charged into the cupola, must be carefully studied and facilities provided to eliminate manual labor wherever possible and make this labor most effective when necessary to depend on it.

I will consider first, briefly, layout of the storage yard and means for handling the stock. Assuming a foundry of moderate capacity, for which ample ground for an accumulation of stock will be provided, materials should be delivered by cars on a railroad switch track running parallel to length of foundry on the side where cupola house is located. The distance between foundry building and this track should allow space for storage adjacent to the siding and for a narrow-gauge yard track between the storage piles and the building. It is evident that the layout of stock yard will depend upon local conditions, but the principles here given will be applicable in any plant.

The Material Yard

Pig iron should be piled in the yard, with a label on each pile giving the brand and the grade of iron, also the initial and the number of car on which the iron was received. A good plan is to mark pigs near the bottom layer of the pile which will not be disturbed until the pile is nearly used. From the car records the analysis and complete information regarding the particular carload

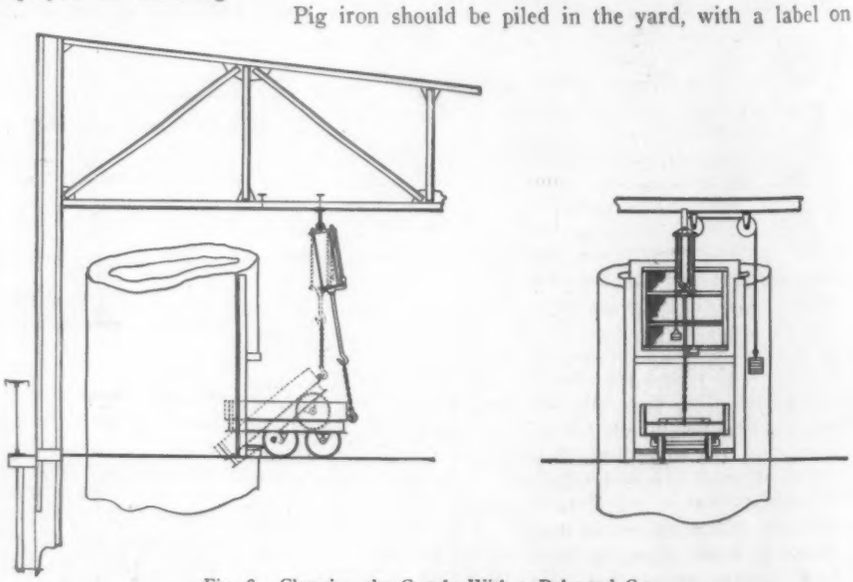


Fig. 2.—Charging the Cupola With a Balanced Car.

*Presented at the convention of the American Foundrymen's Association, Pittsburgh, Pa., May 23-26, 1911.

†Vice-president and general engineer, Whiting Foundry Equipment Company.

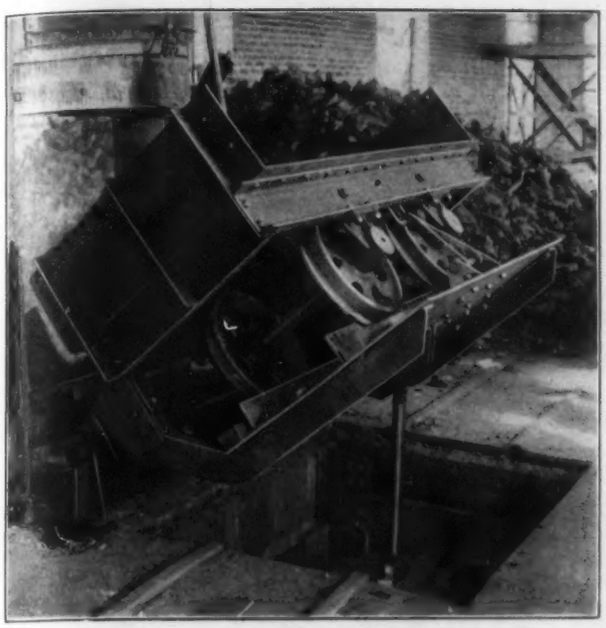


Fig. 3.—The Side Dump Charging Car in the Dumping Position.

should be obtainable. Scrap iron is simply dumped into bins, the different grades being kept separate. Coke should be stored in covered bins. When the tonnage handled is sufficient to make the investment profitable, a traveling or gantry crane covering storage yard should be installed. It should have high-speed movements and be fitted with a magnet for unloading pig and scrap and for manipulating a drop weight for breaking scrap. This crane should also be used for handling heavy flasks in and out of storage, and for loading castings to be shipped. The crane may be fitted with a grab bucket to handle coke and limestone. A jib crane may be substituted for the traveler in smaller plants and perform similar functions, to a limited extent. Fig. 1 illustrates an electric gantry with magnet such as could be used for covering the foundry yard.

Disregarding the primitive methods still occasionally employed of using barrows and dumping the stock on the charging floor, to be rehandled in making up the charges and again to charge into cupola. I will briefly review various modern methods of handling cupola stock from yard to cupola. The charges should be collected on cars, the proper amount of the different grades being selected and weighed and not again handled until introduced into cupola. Two-ton cars, properly constructed and equipped with roller bearing axles, can easily be pushed over level tracks by one man. When warranted by conditions an electrically operated transfer car may be used to transport the charging cars while the charges are being collected. A scale may be mounted on the transfer car to weigh the charges if desired. After the charges are weighed the cars are elevated to the charging platform by an elevator, or if the yard crane is available the cars may be constructed with means for attaching slings and the cars with the charges lifted intact to the charging floor, but this latter method is not an economical one and is only permissible in case of accident to the elevator. Iron and scrap may be elevated to the charging floor with a magnet crane, but this method requires additional space on the charging floor and involves extra handling, and is therefore not recommended.

Storage space for about 50 per cent. of melt in one heat should be provided for on the charging floor and a sufficient number of cars to carry this stock must be supplied for convenience and economical operation. As soon as emptied the cars are lowered to the yard and the charges replenished for a later period in the heat. A system of tracks on the charging floor should provide for constant forward travel of the cars and an open track to the elevator for the cars that have been unloaded.

If desired, the cars may be provided with flat-tread wheels, suitable for a plate floor, or with combination wheels which may be used both on the track and the plate floor. A special design made by the Whiting Company has a platform overhanging at one end so that when the load is properly adjusted it will almost balance on one axle. By a handle at the other end of car it may be readily turned and pushed in any direction. When proper arrangements are made the charges may be dumped into the cupola from this car. It is backed up to the charging door, the wheels blocked and the forward end lifted by a hoist. This device is shown in Fig. 2. Cars with hinged bodies may be dumped into the cupola, the charge falling by gravity on releasing lock pin. Dump barrows are used with the same effect. The skip car, operating on an incline with an automatic dumping device, is also in use in connection with cupolas.

Another device for charging cupolas mechanically consists of a trolley operating on the jib of a crane or on a track which extends into the cupola. The charges are made up as desired in a cylindrical bucket, with drop-bottom doors, which is carried on this trolley. The hoisting and trolley travel movements are operated by power and the drop doors opened by releasing a latch.

Charging Machines

The Whiting patented charging machine is used in connection with a simple design of car having steel plate ends about 12 in. high for iron charges and having a plate body with a swinging side door, hinged at the top, for coke. On the side dump machines the cars are pushed on the hinged platform, locked with a simple hook which engages a loop on the car frame, the platform and the car are raised together by power and the charge dumped. The distribution is under perfect control of the operator, the charges being delivered to the far side of the cupola by a sudden, and to the near side by a slow, hoisting movement. Fig. 3 illustrates this machine in the dumping position. End dump machines are supplied when conditions require them, but side dump cars are preferred as they do not have to be turned to place on the machine. Fig. 4 is a reproduction of a drawing of an end dump machine. The compound machine is recommended for situations in which the charging floor is too low for securing the greatest efficiency in cupola operation. The hinged platform with the car on it is first raised to the proper level and at that point is dumped by a separate power device in a manner similar to the plain machine.

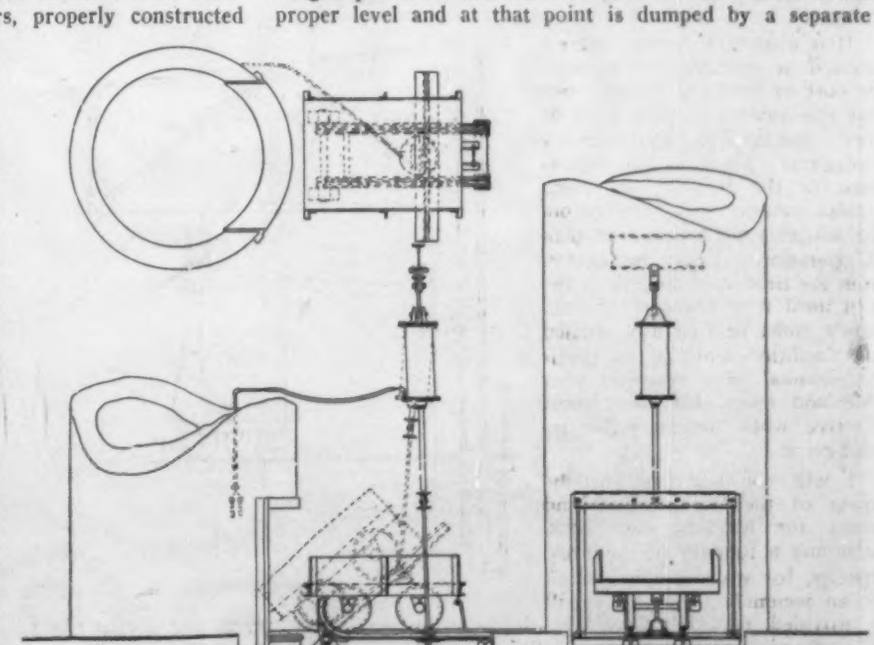


Fig. 4.—Side and End Elevations and Plan View of the End Dump Charging Machine.

Fig. 5 is a drawing of the compound machine where pneumatic cylinder hoists furnish the power. Electric

geared hoists may be substituted for pneumatic hoists. For the electric compound machine only one hoisting mechanism is required, as the design provides for the inclination of the platform without an independent hoist. The crane type of controller is used, allowing a wide range of speeds, which permits the uniform distribution of charges. Fig. 6 illustrates an installation in the Delaware, Lackawanna & Western Railroad's foundry at Scranton, Pa.

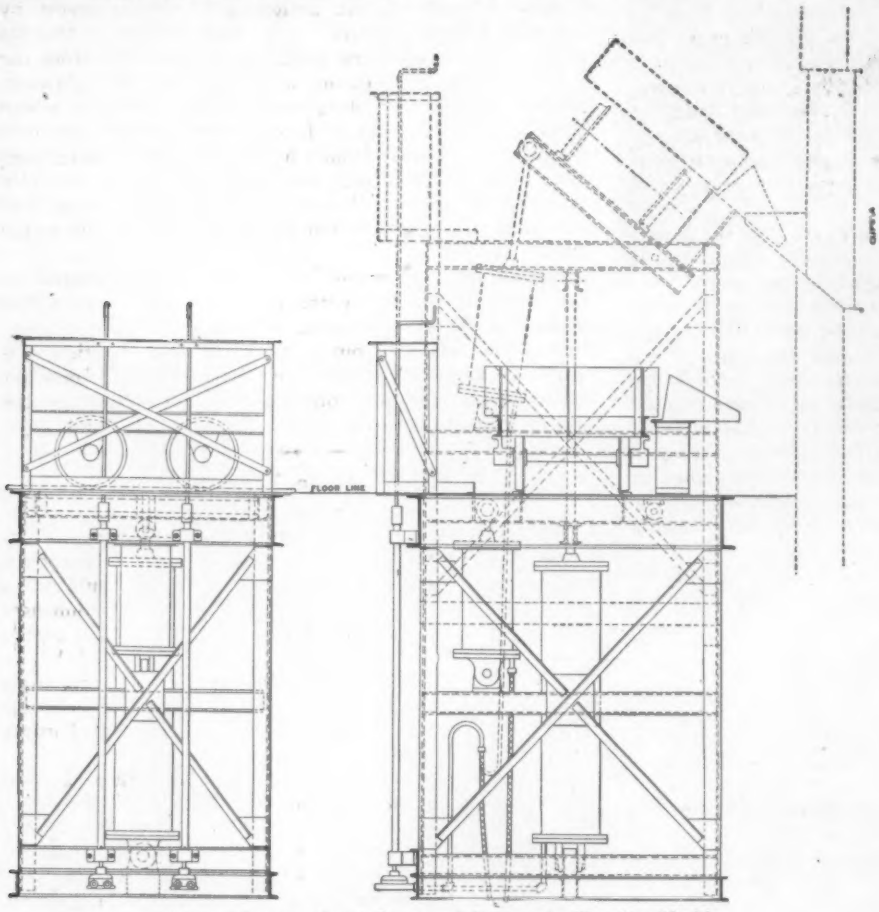


Fig. 5.—Details of the Compound Pneumatic Charging Machine.

The charging door in the cupola used in connection with the charging machine is larger than the ordinary door for hand charging and is set lower. An inclined chute is arranged to receive the stock as it is dumped from the car. The charging machine has an apron plate which overlaps the chute and prevents the iron dropping from the car to the floor. A vertical distance of 4 or 5 ft. between the top of the stock in the cupola and the sill of the charging doors is necessary to provide space for the distribution of the charges. Therefore, the charging floors should be higher than when the charging is done by hand.

With these machines there is a good saving in the cost of handling charges for cupolas having an hourly capacity of from 10 to 15 tons or more, the economy of operation increasing as the output per hour increases. For a No. 9½ Whiting cupola, melting 20 tons per hour, two men with a charging machine can attend to all the charging operations where otherwise five or six men would be required. Another advantage of this machine is that its location is fixed in relation to the charging door and the conditions of operation are always uniform. The cost of installation is small, much less in fact than the extra cost of cars with hinged bodies would be for any moderate sized plant. No additional or special equipment is required in connection with the charging machine. Charging cars only are required, and they are of design that can be used for ordinary hand charging and no greater number of them is necessary.

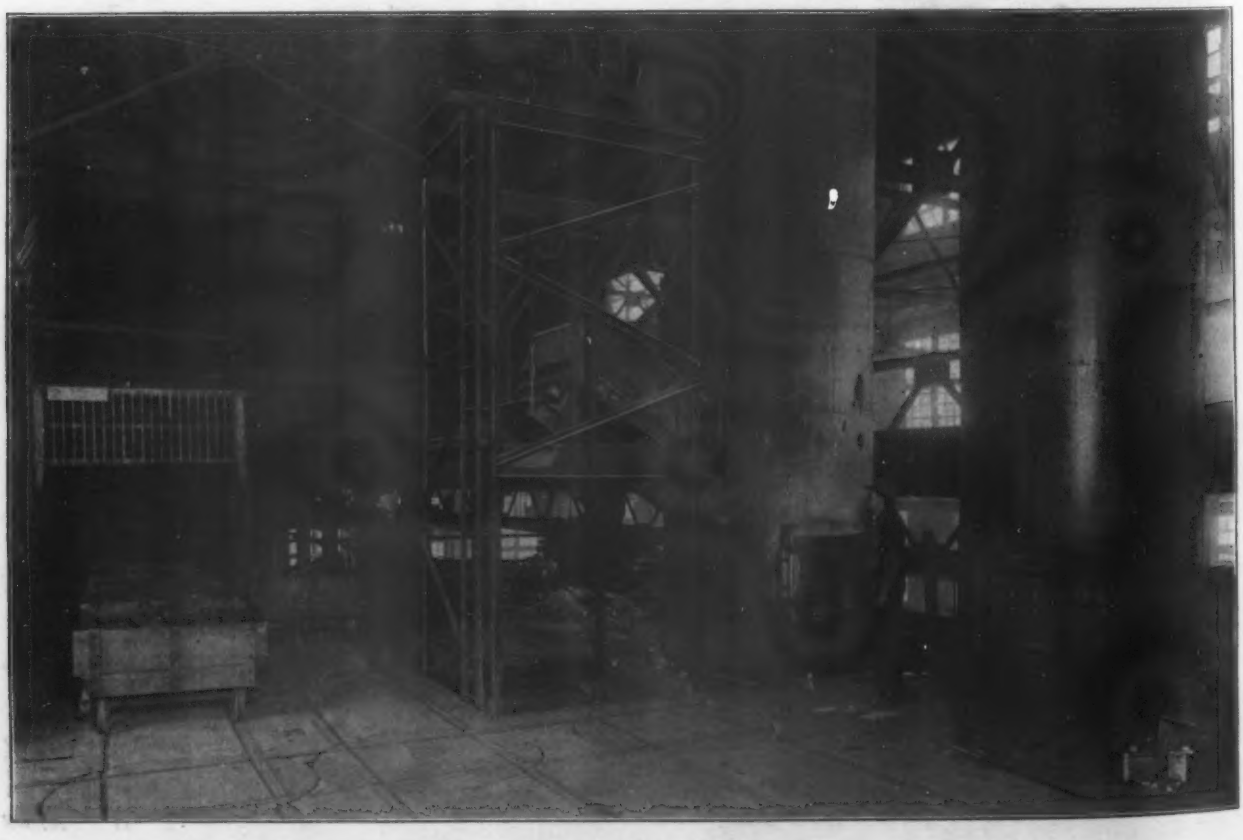


Fig. 6.—The Electric Compound Charging Machine Installed in a Foundry.

Actual Installations

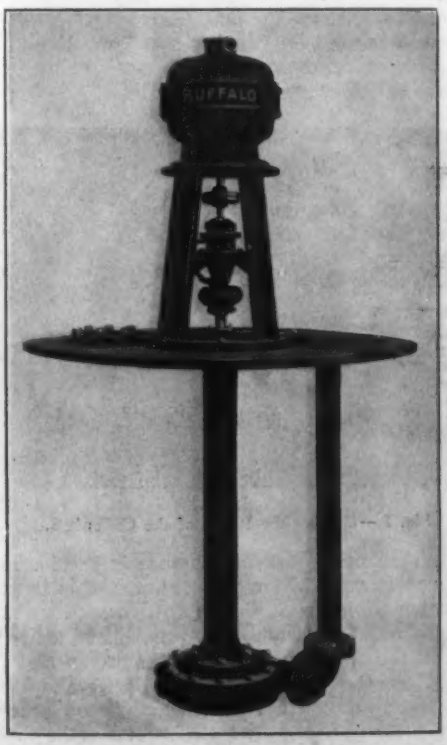
Data regarding actual layouts of charging floors and tracks may be of interest. In the cupola charging department of the Canada Car Company, Montreal, Que., there are two No. 9½ Whiting cupolas for the wheel foundry and one No. 7 and one No. 4 cupola for the gray iron foundry, all equipped with charging machines. The two foundries adjoin and the charging houses are connected, giving ample track space on the charging floor and providing storage facilities below, which is desirable in that rigorous climate. The tracks on the charging floor are arranged with crossovers so that the cars may travel continuously without interference.

Two No. 11 Whiting cupolas are used in the wheel foundry of the American Car & Foundry Company, at Madison, Ill., and both are charged by pneumatic machines. A special location of elevators was necessitated by the peculiar yard arrangement. The end elevators are used for iron; the elevator on the side for coke. Each cupola is served by the elevator nearest to it in ordinary operation. The tracks on the charging floors have storage capacity for about 70 cars. A transfer table at each end is arranged so that a loaded car from the elevator may be transferred to any storage track; turntables in the middle provide passage from any one track to the other, and empty cars are transferred from the charging track to elevator, thus completing the circuit.

The charging floor to be installed at the plant of the Pennsylvania General Electric Company, Erie, Pa., is designed to be served both by a traveling yard crane and elevators. A transfer car makes connection with all the storage tracks and with the tracks to the charging machine. Two No. 11 Whiting cupolas, having a capacity of from 24 to 27 tons each, are used, and two charging machines are furnished for each cupola.

A Self-Contained Vertical Sump Pump

Recently the Buffalo Steam Pump Company, Buffalo, N. Y., has placed on the market a sump pump in which interesting constructional details have been incorporated. All parts of the outfit are easily accessible for inspection. The unit can be lifted from the pit without dismantling and the latter can thus be cleaned out with very little trouble.



A New Type of Vertical Pump for Draining Sump Pits Built by the Buffalo Steam Pump Company, Buffalo, N. Y.

The weight of the moving part is taken on a self-aligning ball bearing of the thrust type, which is lubricated in a somewhat novel way. To insure a positive and continuous supply of oil a reservoir is bolted to the shaft with an oil-tight joint immediately below the bearing in such a way as to inclose the lower part of the latter. This chamber, as it revolves with the shaft, causes the oil to be thrown to the inside periphery of the reservoir by centrifugal force. A feed pipe, which is bent so that its opening faces against the revolving oil, projects from the lowest part of the bearing and picks up the lubricant. Sufficient pressure is developed by the speed at which the oil reservoir rotates to force the oil through this pipe to an upper chamber, from which it flows downward over the bearing. To protect the shaft from the corrosive action of the water and from being fouled by waste and stringy matter in the sump pit it is inclosed below the cover.

As the outfit is entirely self-contained it is possible to test the pump and the motor at the factory under actual running conditions. Another advantage of this arrangement is that when the outfit arrives at its destination it is simply necessary to uncrate it, set it in the sump pit and make the electrical connections to the motor and the automatic starter and the unit is ready for operation.

A Study of the Blast Furnace

The Harbison-Walker Refractories Company, Pittsburgh, Pa., manufacturer of firebrick for all purposes, has brought out an exceedingly valuable publication entitled "A Study of the Blast Furnace." It comprises 163 pages of text and illustrations, is of pocket size and is bound in leather. The work has been prepared by an expert in the operation of the blast furnace and condenses in most convenient form the latest practical and scientific information on this subject. The matter is treated under six chapters.

Chapter I gives a description of the plant of a blast furnace, showing the general construction of the stack and the details of its various parts, including the devices for filling and the extensive system of piping required. Chapter II covers ores and their treatment, entering into such matters as concentration, nodulizing and briquetting. Chapter III considers fluxes and fuels, giving the various methods of manufacturing coke. Chapter IV treats of burdening the furnace, taking up the details of the various materials entering into the burden. Chapter V considers the operation of the furnace, entering into furnace troubles to a considerable extent. Chapter VI discusses furnace reactions.

The publication will undoubtedly be appreciated by all who are interested in the operation of blast furnaces and probably by many in the iron trade who would like to know more about the process followed and apparatus employed in the manufacture of the pig iron they use. The work is copyrighted by the company.

Fewer Freight Cars Idle

Idle car figures of the American Railway Association showed a substantial decrease for the two weeks ended with May 24. The total number of unused cars of all classes, which was 188,847 when the previous statement was made up, had been reduced to 168,233. There was a better distribution of equipment as well, the shortages, which totaled 1569 on the earlier date having been brought down to 835 by May 24. The net surplus was accordingly 167,398.

The reduction of 19,880 in the net surplus of cars amounts to 10.5 per cent, and is the first real improvement to develop since the statement of August 31, 1910. The largest number of cars out of commission this year was reported March 2, when the total was 196,217. This has been reduced with each fortnightly statement. The smallest number of idle cars in recent months was reported October 26, 1910, when the crop-moving needs resulted in a demand for all but 29,131 cars. The following table shows the surplus and shortage of cars on 172 roads on May 24:

	Surplus.	Short.	Net surplus.
Box	51,200	253	50,947
Flat	12,906	345	12,561
Coal, gondalo and hopper	68,043	148	67,895
Other kinds	36,084	89	35,995
Total	168,233	835	167,398

Raising the Battleship Maine

Progress of the Work in Havana Harbor

BY CHARLES H. HUGHES, NEW YORK CITY

After investigating a large number of plans for raising the battleship Maine, sunk in Havana Harbor February 15, 1898, the board of army engineers, of which Col. W. M. Black is the senior member, charged with this work, recommended one that was approved by President Taft on October 13 of last year. Soon after the approval of the plan work was started.

Fig. 1.—View Showing the Arrangement of the Caissons Around the Vessel.

The Government had two objects in wishing to raise the Maine; first, to remove an obstruction to navigation and, second, to attempt to recover the remains of those who perished in the unfortunate incident of 1898. If it were not for the latter she would doubtless be dynamited and the débris dredged from the harbor. For the wreck is practically worthless, and it will cost many times more to remove it than what it is worth as scrap iron. Even if it was raised and could be repaired, it would be of little use for actual service, as the designs of battleships have changed so much in the past few years.

The Plan

The plan adopted and on which will be spent the $650,000 appropriated by Congress provides for entirely exposing the Maine to view. A cofferdam 399 ft. long, a view of which is given in Fig. 1, will be built around her and the water contained in the inclosed area pumped out.

The cofferdam is composed of cylinders 50 ft. in diameter made of Lackawanna steel piling and connected by arcs of similar piling, arranged as shown in Fig. 2. The cylinders, some of which are illustrated in Fig. 4, as well as the spaces between them and the arcs, are filled with a heavy clay dug up near the work. An idea of the material can be obtained from the fact that a dipper dredge having a capacity of 1200 cu. yd. per day of ordinary material could only remove 300 cu. yd., while an hydraulic dredge with a capacity of 12,000 cu. yd. per day could remove but 1400 cu. yd. The clay is pumped from the hydraulic dredge through a steel pipe line and is discharged into consecutive cylinders in layers of about 10 ft. deep. Thus, instead of completing one cylinder before another all are kept approximately at the same stage of completion. It is interesting to note that a man can walk on top of a cylinder five minutes after it has been filled. When the cylinders and the spaces between the arcs are filled, the pumping out of the water around the Maine will be started.

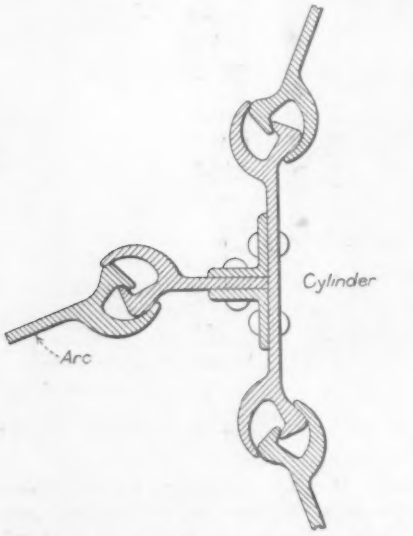


Fig. 2.—Arrangement of the Cylinder and the Arc.

Fig. 3.—Driving the Piling of the Cofferdam.

To reach a suitable bearing surface in the harbor bottom piling 75 ft. would be required, but as this length was difficult to handle it was divided into two sections. First a 50-ft. length was driven and to it was spliced a 25-ft. one, alongside of the first a 40-ft. length was driven and a 35-ft. one spliced on, then alongside of the latter another composed of 50-ft. and 25-ft. sections, and so on around the entire circumference. By using different lengths the joints were broken. To keep the piling in a cylindrical shape wooden templates were built and held in place by a central pile. With the template thus secured, the piles were swung into position from barges by derricks and then driven by hammers, as shown in Fig. 3.

Driving the Piling

The driving of the steel piling was done by steam hammers. It was essential that the hammer should be

Fig. 4.—A Portion of the Cofferdam, Showing the Cylinders.

light, yet powerful and could be easily swung from a derrick boom, as shown in Fig. 3. The Arnott hammers built by the Union Iron Works, Hoboken, N. J., fulfilled these requirements and two were ordered by the Government.

This particular type, exterior and sectional views of which are given in Figs. 5 and 6, with the exception that in the latter the anvil plate is omitted, has a plain cast iron body with a steam cylinder, *a*, Fig. 6, and valve chest in the upper portion and in the lower a ram, *b*, and a valve rod, *c*, all inclosed, thus protecting them from injury. A feature of the hammer is that in the moving parts there are only two bolts, and these connect the valve rod to the ram. The opening at the bottom is formed with jaws that fit over the top of the steel piling, permitting the insertion of a driving cap. Above the cap are wooden blocks that act as a cushion, thus relieving the hammer of the jar when striking a blow. It will be noticed that the safety buffers and pile plate are within the frame, so that nothing but the throttle is exposed, making a construction which can stand hard usage.

On opening the throttle valve, steam is admitted to the lower end of the cylinder raising the ram to the top of its stroke when a valve, *d*, actuated by a rod is opened and steam enters the upper end of the cylinder while the lower end is opened to exhaust. The downward stroke is accelerated by the steam pressure on the piston *e*, the force of the blow being correspondingly increased. When the ram strikes the pile the valve is reversed by the rod and the ram is raised. The total downward force of the steam and ram is 2392 lb., and this being delivered 135 times a minute gives with a 14-in. stroke a total of about 376,000 ft.-lb. per minute. Each hammer weighs approximately 35000 lb. and uses steam at 80 lb. pressure. In the present case the boiler is on the same barge as the derrick.

Pumping Out the Enclosure

The area inclosed by the cofferdam will be pumped out by two pumps mounted on floats, and as the water falls the floats will consequently be lowered also. The pumps are of the split casing double suction volute type, one, a 12-in., having a capacity of 4000 gal. per minute and the other an 8-in., with a capacity of 1800 gal. The maximum pumping head in each case is 65 ft. and the minimum 5 ft.

The features to be noted are the double suction, and the casings, which are split horizontally. With a double suction the incoming fluid enters on both sides of the impeller and is discharged from it into a common vortex chamber. This construction eliminates all difficulties from end thrusts that are often troublesome with a single suction pump. By splitting the casing the working parts may be readily removed for inspection and repairs, without breaking the suction or discharge connections or disturbing the alignment. The pumps were furnished by the Jeanesville Iron Works Company, New York.

Directly connected to the 12-in. pump is an 100-hp. General Electric type K motor, using 3-phase, 60-cycle, 220-volt current, while to the 8-in. pump is connected a 50-hp. motor of the same make and type. The current is transmitted from the power house on the shore by a cable.

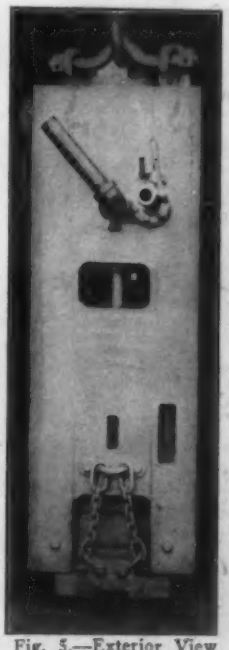


Fig. 5.—Exterior View of the Hammer.

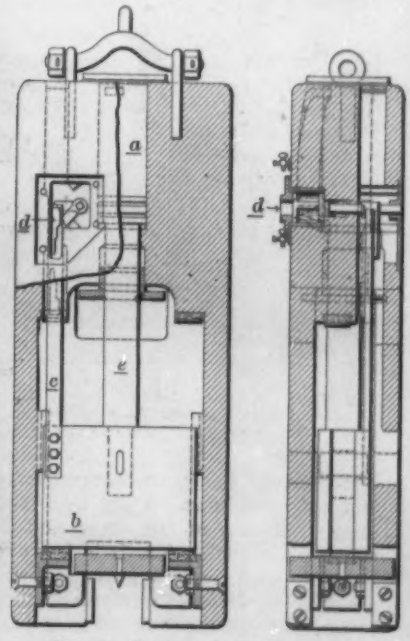


Fig. 6.—Section of the Hammer.

The Arnott Hammer, Made by the Union Iron Works, Hoboken, N. J.

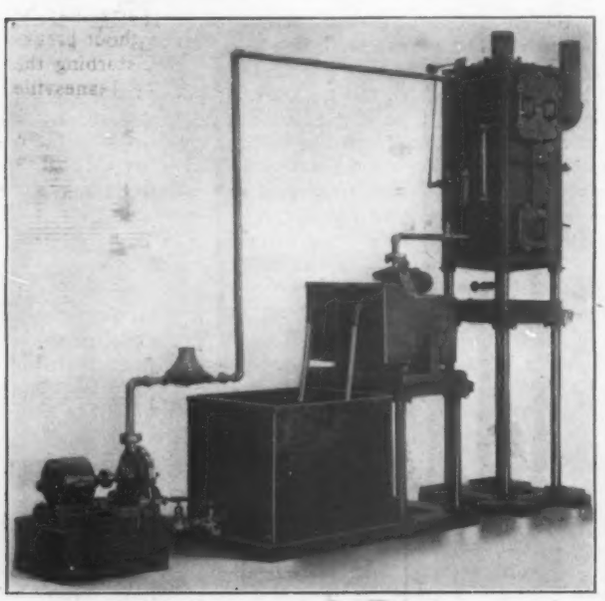
When the Maine is exposed a careful examination will be made by the army engineers and a report sent to Washington. If the hull is not too badly damaged an effort may be made to raise it, but if this cannot be done it will be broken up. It is contemplated removing the military mast and placing it over the plot in the National Cemetery at Washington, where the sailors whose bodies were recovered are buried.

New Liquid Weigher

One of the particularly interesting exhibits at the recent Architecture and Building Show in New York was the combined one of Henry R. Worthington, the Blake & Knowles Steam Pump Works, the Laidlaw-Dunn-Gordon Company and the Deane Steam Pump Company. Occupying the center of the space was one of the few operating exhibits to be seen at the show. It was a type A open pattern liquid weigher, a recent product of Henry R. Worthington, 115 Broadway, New York City, particularly developed for accurately measuring and recording, by weight, the flow of hot water, chemicals, oils and other liquids that cannot be measured satisfactorily by meters.

The illustration herewith is a view of the exhibit as erected at the Worthington works before being shipped to the show. In connection with the weigher, but in this instance serving merely as an elevated tank, was a Blake-Knowles 150-hp. open feed water heater of the type illustrated in *The Iron Age* May 5, 1910, demonstrating the automatic valve control of the feed water flow, and a Worthington centrifugal pump returning the water from the tank into which the weigher discharged through a 1-in. Worthington water meter to the heater. The pump was a 1¼-in. two-stage house pump of 1800 gal. per hour capacity against a head of 70 ft., and was driven by a direct-connected 1-hp. motor through a flexible coupling. The pump ran with such remarkable steadiness and absence of vibration that a dime could be stood on its edge on any level part of the pump.

An important advantage of the weigher is its extreme accuracy in the weighing of liquids of any nature. For example, it is independent of the density and the temperature



The Type A Open Pattern Liquid Weigher for Recording the Flow of Liquid Made by Henry R. Worthington, New York City.

of the liquid, its action being governed entirely by weight, and not by volume. A big field is therefore opened to it in the weighing of hot water, and it has especial value in power plant application. It is less expensive and is said to be vastly superior to any of the awkward and troublesome weighing outfits used in many plants for lack of something better. In the sugar industry it has been found the first practical means of measuring fusion juice. Its accuracy is practically unaffected by even a considerable variation in the rate of flow, but it is desirable to have the liquid flow into it by gravity. When properly adjusted it is accurate to within ½ per cent. The weigher has no bearing or wearing surfaces, no valves to leak, and presents no feature which through friction or wear affords an opportunity for any falling off in the original efficiency.

As may be seen from the engraving, the weigher consists of two tanks pivoted at a point in their height which is above the center of gravity when the tank is empty. As the tanks alternately fill the center of gravity is raised until it comes above and to one side of the center of support, which causes the tank to tip on its knife edge bearings and start the discharge of the liquid through the bent pipe outlet. This pipe is continued within the tank as the short leg of a siphon, so that the flow being once established continues until the tank is drained, even after the center of gravity has been lowered, and the tank tilts back to the normal position.

As each tank tips it automatically turns the rocking inlet spout so as to deflect the water into the second tank, and that one is filled while the first is discharging. Each movement of this spout actuates a mechanical counter which is calibrated to read either the number of loads of the tanks or directly in pounds, gallons or whatever unit of measure may be desired. From the nature of the action of the weigher and the sensitiveness of the balance of the tanks, the tank loads are all of uniform amount. Since the record is by weight, the counter reading is final, without necessity of making any allowances or corrections.

Other exhibits in this space at the Architecture and Building Show were a sectional model of the Worthington turbine meter, a Worthington Arrow meter, so called because the water flows straight through the meter, making it capable of handling the full capacity of the pipe line with insignificant loss of pressure, and a motor-driven Deane triplex power pump.

The new Grand Central Palace was in a sense an exhibit itself, and an appropriate one considering the nature of the show. It was the first time that the building had been opened to the public, but the impressive thing was that this structure, 13 stories high, occupying an entire block on Lexington avenue from Forty-sixth to Forty-seventh streets, directly over the underground tracks and yards of the Grand Central Terminal, was built and practically completed, except for the remaining interior finishing on the upper floors, in the record time of 8 months and 18 days. The contractors, James Stewart & Co., erected all of the steel work at night, and the whole construction was carried out without interfering in the slightest with the regular schedules of the trains of the New York Central and New Haven roads running beneath it.

The Vitrolite Company's Improvements.—The Vitrolite Company, Parkersburg, W. Va., maker of white glass, which the manufacturer claims is better than marble for interior finish, has recently let the contract to L. C. Poling, a local builder, for a large addition to its plant. The extensions will aggregate 43 x 430 ft. A new annealing lehr and rub bed and an addition to the cutting department are being made. Another melting tank, with auxiliaries, is also being erected. The casting table is being extended to take in Vitrolite 72 in. wide. A steel supported water tower of 25,000 gal. capacity is also being erected. The Vitrolite Company has been doing considerable with its product in finishing buildings, in some cases the walls and ceilings of entire rooms being covered. Other uses for this product are operating tables, counter tops, etc. The new addition will about double the present capacity and will be ready for operation early in August.

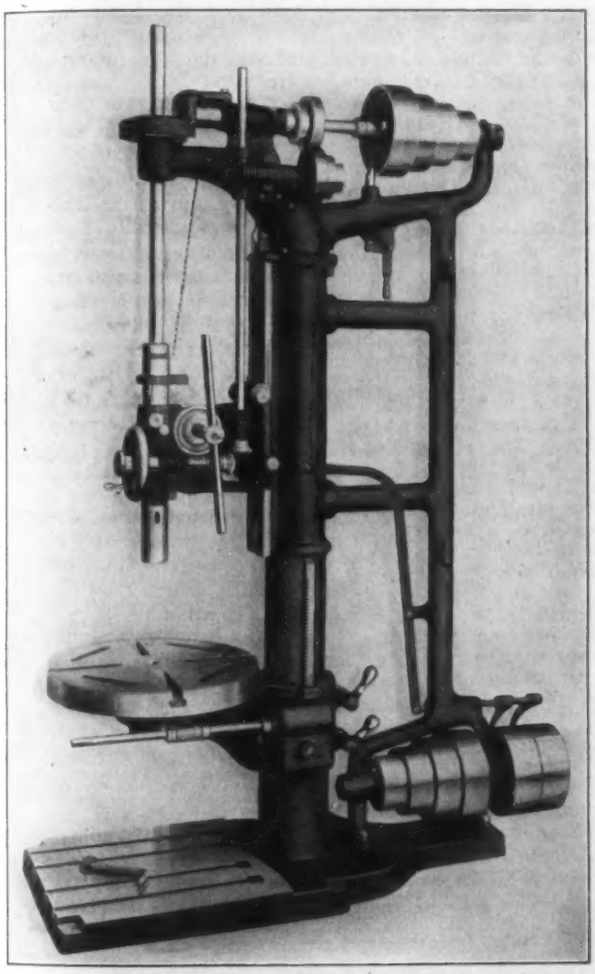
American Vanadium Facts.—The Vanadium Sales Company of America, Frick Building, Pittsburgh, Pa., in the May issue of its house organ, publishes a complete report of the exhibitors who co-operated with the company in the preparation of cast vanadium products for the exhibit connected with the recent convention of the American Foundrymen's Association at Pittsburgh, and also gives the complete address before the convention of its engineer of tests, George L. Norris. The publication comprises 12 pages and gives numerous illustrations. It will prove to be greatly interesting and instructive to those who are looking into the subject of the use of vanadium in the manufacture of iron and steel.

A special meeting of stockholders of the Allegheny Steel Company, whose general offices are in the Farmers' Bank Building, Pittsburgh, and works at Brackenridge, Pa., will be held July 6 for the purpose of increasing the capital stock from $3,000,000 to $3,500,000. No important improvements or extensions are contemplated, the increase in capital stock being made so that it will more closely represent the actual value of the plants owned by the company.

A Heavy Pattern Drill Press

The 24-in. sliding head, heavy pattern drill press, shown in the illustration, is fitted with back gear, power feed, wheel and lever automatic stop. It is built by the Frontier Iron Works, Letchworth and Grant streets, Buffalo, N. Y. Rigidity is a feature of the design, the purpose being to withstand the strain occurring with the high speed steel drills now used.

The base is heavy and well ribbed to prevent springing. The column is of large diameter with a wide face for receiving the head, and is supported by a strong back brace. The massive knee has a long bearing on the column and a large circular bearing for the hub of the table. The lower portion of the column is closely finished to insure proper alignment of the table. The knee has a special clamping handle and is raised and lowered through worm gearing and pinion on the rack, an arrangement which holds the part securely with no possibility of dropping, even should the clamp screws be loose. The round table and the base have ample slots for holding work. The table is raised and lowered by rack and pinion and is counterbalanced.



The Modern 24-In. Sliding Head Drill Press Built by the Frontier Iron Works, Buffalo, N. Y.

The high carbon steel spindle is provided with quick return and is operated by a steel rack and pinion and worm gearing, the worm running in an oil bath. With small drills a lever feed can be used. The spindle sleeve has a sliding collar for regulating the automatic stop feed mechanism. The crown bevel gears are protected, and the back gearing is closed in. The machine has the company's tilting table. The knee is in two parts, and on the outer end is a large flange, faced and bored to receive the swivel stem, on which the table stem fits. On the periphery of the flanged swivel is cut a worm gear which engages a worm mounted on a bracket on the lower side. The worm shaft is squared on both ends for a wrench, which permits the table to be tilted to either side accurately to any desired angle.

The specifications of the machine follow:

Minimum distance between base and spindle, in.	28
Maximum distance between base and spindle, in.	56½
Maximum distance between table and spindle, in.	30
Traverse of table on column, in.	14
Traverse of head on column, in.	20
Traverse of spindle, in.	8½
Diameter of table, in	22
Diameter of column, in	6½
Diameter of spindle, in.	1 7/16
Diameter of spindle sleeve, in	2¾
Morse taper of spindle	No. 4
Pitch diameter of crown gear, in	7
Bevel gear ratio	2 to 1
Diameter of tight and loose pulleys, in.	10
Face width of tight and loose pulleys, in	3
Number of cone pulley steps	4
Diameter of largest cone pulley step, in.	10
Diameter of smallest cone pulley step, in.	5½
Speed of countershaft, r.p.m.	300
Number of spindle speeds	4
Minimum spindle speed, back gears in, r.p.m.	22
Maximum spindle speed, back gears in, r.p.m.	79
Minimum spindle speed, back gears out, r.p.m.	81
Maximum spindle speed, back gears out, r.p.m.	272
Power required, hp	1
Overall hight, in.	84½
Floor space required, in.	22 x 58

This drill is built along the same general lines as the 20-in. drill press which was illustrated in *The Iron Age* May 19, 1910, and is furnished with special metal alloy bearings.

The Joliet Rolling Mill Company

The Joliet Rolling Mill Company, Joliet, Ill., manufacturer of iron and steel bars and rolled specialties, has increased its capital stock from $150,000 to $250,000 for the purpose of installing additional equipment and making extensive improvements. These improvements will include a new 8-in. mill, together with the necessary furnaces, also a 22-in. mill, with rolls for making rounds up to 4 in. and flats up to 12 in. The new equipment to be installed will consist of several alligator shears, rotary shear, engine lathes, planers, drill presses, pipe and bolt cutters, motors, etc. A multiple twisting machine will also be installed for twisting reinforced concrete bars cold.

The company carries in stock at all times a complete assortment of its Arrow brand of irons which are adapted for stay bolt, locomotive and engine purposes, etc. In the manufacture of this iron the company places stress upon a proper balance between toughness and tensile strength, compatible with a product of suitable softness. Under test the company claims that its Arrow brand iron has a minimum tensile strength of 50,000 lb. and a minimum elongation of 28 per cent.

E. K. Orr is now vice-president and general manager of the company. Mr. Orr has had a long experience in the iron and steel business, having been formerly connected with the Shelby Steel Tube Company, Shelby, Ohio; Worth Brothers Company, Coatesville, Pa., and Elyria Iron & Steel Company, Elyria, Ohio. George H. Lowe is superintendent and chief engineer, in charge of operations.

Railroad Equipment Orders.—Orders for railroad equipment include the following: Canadian Pacific, 1000 steel underframe box cars and 400 all-steel gondola cars, and are in the market for 500 box cars; Grand Trunk Pacific, 15 Pacific type, 20 consolidation and 10 switching engines; Pennsylvania Railroad, 41 coaches and 20 baggage cars; New York, New Haven & Hartford, 15 Westinghouse electric locomotives and 15 electric switching locomotives; Missouri, Kansas & Texas, 108 miscellaneous freight cars. The Wabash-Pittsburgh Terminal is figuring specifications on 500 all-steel hopper cars.

The Balbrooke Company, sales engineer and specialist in hoisting and conveying apparatus, Machesney Building, Pittsburgh, has been appointed to represent in that territory the Ohio Grease Lubricant Company, Loudonville, Ohio, manufacturer of a system of grease lubrication for steam cylinders.

The Parkersburg Iron & Steel Company, Parkersburg, W. Va., maker of steel sheets, has recently installed a complete galvanizing plant, containing one galvanizing pot, but which has been arranged to accommodate two pots. The new galvanizing department was built entirely from plans of the company, which is now making galvanized sheets that will be put on the market under the trademark of Parkersburg Smooth Galvanized.

The Machinery Markets

A decidedly better railroad demand has developed in New York. Two carrying companies have inquiries out and another has a large list in preparation. Export business continues to attract attention. The plans of the Allied Machinery Company of America will necessitate the readjustment of the selling arrangements of some 60 manufacturers of metal working machinery who have entered into contracts, and the fact that Capt. Godfrey L. Carden is to be general manager of the new export company has aroused much favorable comment. Some good business for export to Japan has developed in Cincinnati, but domestic inquiries there are scarce. Trade is slightly better in Cleveland. In Louisville the export trade commands the principal attention, and some improvement is noted in local inquiries. Less encouraging reports come from Detroit and Chicago, where business is quiet, although in the latter market the International Harvester Company continues a good customer. Business on the Pacific Coast is developing noticeably. The Standard Oil Company is the principal buyer there and the railroads are coming into the market. Good crop prospects and the settlement of the Mexican trouble have put the machinery trade on a more satisfactory basis in Texas, and many new enterprises have come forward.

New York

NEW YORK, June 7, 1911.

The railroad demand has improved materially. The New York Central is inquiring for mechanical equipment and will make an expenditure of $50,000 and the Pennsylvania Railroad is inquiring for some machine tools. The Delaware & Hudson Railroad is preparing an extensive list which gives promise of being one of the largest of the year, covering the machinery requirements for its large shops at Watervliet, N. Y. The company proposes to build a plant capable of repairing at least 200 locomotives at a time, in addition to manufacturing some of its own engines. The locomotive shop will be 275 x 300 ft. and there are other buildings to be erected, including a blacksmith shop and boiler and tank shop, so it can be seen that the list will necessarily be a large one. V. Z. Caracristi is in charge of the preparation of the machine tool list. The machinery demand from other sources is improving. A large Pennsylvania boiler works is preparing to spend about $50,000 for machine tools and the New York Pump Works is making up a large list. The contractors of the Catskill water supply works are buying pumping machinery and general contracting equipment liberally, and the indications are that their future demands will be heavy. Makers of power plant equipment find business much better, as manufacturers in general are taking advantage of the opportunity to shut down part of their power and make necessary repairs and replacements. The activity in this direction is taken as an indication that better business is expected to develop, as the shop owners seem to want to bring their plants up to a better point of efficiency.

Further details of the plans of the Allied Machinery Company of America, which was formed by officials of the National City Bank of New York, have come to light through the publication of the articles of incorporation of the company, filed at Albany, N. Y. The company has a registered capital of $100,000. Capt. Godfrey L. Carden, of the United States Revenue Service, who, through his recent connection with the Department of Commerce and Labor, is recognized as an authority on the marketing of American machine tools abroad, is vice-president and general manager of the company. Samuel McRoberts is president; Thomas A. Reynolds treasurer and H. C. Newlands secretary. With the exception of Captain Carden all the officers are connected with the National City Bank. The declared intention of the company is to sell American machine tools in foreign countries, and the company will be practically an export association, as it will represent the interests of more than 60 American machinery manufacturers, according to the contracts made so far. Mr. McRoberts and Captain Carden left last week for Paris, where an office will be opened as soon as possible. Arrangements have also been made to begin business in Russia and Austria and a general European campaign will be conducted from Paris.

The plant of the A. S. Cameron Steam Pump Works at 433 East Twenty-third street, New York, which was acquired several months ago by the Ingersoll-Rand Company, 11 Broadway, New York, will soon be dismantled and the works will be removed to a place not yet decided upon. The Ingersoll-Rand interests are now looking about for a site, and the plant will be moved either to Phillipsburg, N. J., where the company has a large plant in operation, or to Trenton, N. J., or Philadelphia. At present 250 men are employed in the Cameron works. When the new plant is erected it will be enlarged to double the existing capacity. Other lines of pumping equipment will be added and the business will be conducted under the present name. In other words, although the company is controlled by the Ingersoll-Rand interests, it will maintain its own individuality and will be operated as a separate corporation. Plans are now being made for purchasing additional mechanical equipment. That now in use in the works is, on the whole, in good condition and most of it will be moved to the new plant, but the enlargement of the business will call for heavy expenditures of machinery, especially in the line of metal working equipment.

The New York Central Railroad is preparing a list calling for heavy expenditures for machinery requirements, principally in the line of machine tools. The company recently decided to spend $1,000,000 for equipment, and a large part of this appropriation will be used for machinery. Lists recently issued by the company have been purchased against of late, but all of the equipment inquired for was not bought. It is understood that some of these requirements will be included in the new list. The company now has inquiries in the market calling for about $50,000 worth of machinery and this material it is understood is to be purchased very soon. Following its recently established custom, the New York Central has not issued the list of its present requirements to the trade generally, but has sent out separate inquiries, each calling for one machine. Some machinery-selling houses have received many of these inquiries, while others have been given only one or two.

The American Concrete Steel Company, Newark, N. J., has completed plans for a five-story building to be built at Sussex avenue and Duryea streets, Newark, for the Lauter Piano Company, whose offices are now at Orange street and Morris & Essex Railroad avenue, Newark. The new plant is to be five stories and 80 x 140 ft. It is estimated that it will cost $75,000. The company's own plant adjoins that of the Westinghouse Electric & Mfg. Company at Newark and the latter company has acquired title to the Lauter factory and will utilize it for storage and manufacturing purposes.

The Harrisburg Mfg. & Boiler Company, Harrisburg, Pa., which has been making extensive inquiries in this market for several weeks, will shortly make purchases against the list it has prepared. The indications are that the company expects to spend about $50,000 and its purchases will include boring mills, lathes, shapers, planers and other machine tools. A number of New York representatives of machine tool houses as well as the large machinery selling firms have put in bids on a large part of the equipment wanted.

The Eagle Pencil Company, 377 Broadway, New York, has had plans prepared by Buchman & Fox, 11 East Fifty-ninth street, New York, for a factory building, 75 x 96 ft., six stories, to be erected at Thirteenth street, near avenue C. The estimated cost is about $70,000.

The Keiner Williams Stamping Company, 109 Third street, Greenpoint, N. Y., has had plans prepared for a factory building to be erected at Pine street and Jamaica avenue, Richmond Hill. The building will be 99 x 154 ft., two stories, of brick and mill construction, and is estimated to cost $27,000.

The Mylocal Mfg. Company, Buffalo, N. Y., has been incorporated with a capital stock of $50,000 to manufacture medicines, drugs and dental supplies.

THE MACHINERY MARKETS

The incorporators are L. H. and M. M. Knapp and E. N. Pratt, Buffalo.

The Huebner-Bleistein Patents Company, Buffalo, is having plans prepared for a third building to be added to its lithographing plant now under construction at Kensington avenue and New York Central Railroad Belt Line, Buffalo.

The Department of Public Works, Buffalo, Francis G. Ward, commissioner, is advertising for bids for remodelling the Broadway arsenal into a city convention hall, including the installation of an electrical lighting plant, heating and ventilating systems.

The Herr-Riegell Company, Buffalo, recently organized for the manufacture of foundrymen's and pattern makers' supplies, has secured factory premises at 1412 Niagara street, that city.

The Republic Metalware Company, Buffalo, is completing plans for a seven-story addition to its plant at Republic street and the Erie Railroad.

The Ilex Optical Company has been incorporated at Rochester, N. Y., with a capital stock of $40,000, to manufacture optical goods and appliances. M. Rosenbloom, S. D. Burritt and H. Keonick, Rochester, are the incorporators.

Bagley & Sewall, Watertown, N. Y., are having plans prepared for a factory building which they will erect this summer. Estimated cost is $40,000.

The New York Mills Company, Seneca Falls, N. Y., has let the contract for the construction of three large additions to its No. 2 plant, these additions being made necessary by the partial demolition of the No. 1 or original plant of the company on Ovid street to make room for the enlargement of the Erie Barge Canal. Upon completion of the new buildings the company's entire industry will be located in the No. 2 plant.

The Aster Paper Company has been incorporated at Skaneateles, N. Y., with a capital stock of $50,000, and will engage in the manufacture of pulpboard and paper. The incorporators are F. A. Murphy, Skaneateles, and G. M. McKee and W. A. McKee, Hinckley.

Cadby & Sons, 52 Grand street, Albany N. Y., have let contract for a three-story addition which they will build to their mill.

A. Mendleson, Albany, has had plans prepared for a potash factory to be built at Vine street, Broadway and Fourth avenue.

Bids are being received by the Board of Supervisors of Schenectady County, Schenectady, N. Y., John H. Peters, clerk of the board, for the furnishing and installation of a pneumatic water system.

The Mohawk Valley Cap Company, Utica, N, Y., has let contracts for construction of a one-story addition, 146 x 235 ft., to its mill on Park avenue.

The Steroga Paper Company, Little Falls, N. Y., is receiving bids for a mill building, 50 x 100 ft., which it is planning to erect at once.

The Electric Boat Company, 11 Pine street, New York, has been awarded a contract by the Chilian Government for building two submarine boats, the aggregate cost of which will be about $1,000,000. The boats will be constructed at Seattle, Wash., and it is said that the company is figuring on other vessels of a similar type which will comprise a flotilla for the defences of the Chilian coast.

Catalogues Wanted

The Ozark Cooperage & Lumber Company, St. Louis, Mo., desires catalogues of manufacturers of machinery for making wire looms for weaving wire cloth, square mesh and poultry netting, in addition to manufacturers of drawing machines.

New England

BOSTON, MASS., June 6, 1911.

The machinery trade notices very little change in the demand for equipment. Sales are chiefly confined to single tools and small lots. The Massachusetts State Employment Bureau reports an increased activity in the labor market. Employers in various trades are making numerous requisitions for help, but their wants are confined to skilled workmen. The number of unskilled men out of employment is large. Denial is made of a report sent to London that the Argentine Republic had defaulted its contract for the two battleships of the Dreadnaught class, which are held by the Fore River Shipbuilding Company, Quincy, Mass., and the New York Shipbuilding Company, Camden, N. J. New England is interested in the award by the Chilian navy for a contract for two submarine torpedo boats to the Electric Boat Company. While the boats will be built at Seattle, doubtless the machinery will be constructed at the new shops of the New London Ship & Engine Company, Croton, Conn.

James Hustis, vice-president in charge of the Boston & Albany Railroad, announces that F. A. Ryer has been appointed purchasing agent for the system, with offices at the South Station, Boston. This action is under the new management for joint control of this road by the New York Central, and New York, New Haven & Hartford Railroads.

The announcement of the award of the contract for the new factory buildings to be erected by the Peck, Stow & Wilcox Company, Southington, Conn., reveals the magnitude of the company's plans. The machine shop building will be 50 x 300 ft., five stories; the forge shop 60 x 400 ft., one story; the foundry 60 x 210 ft., with annex 30 x 112 ft., all one story; a building for miscellaneous purposes 40 x 112 ft., one story, and a wood-working building 40 x 154 ft., two stories. All will be of brick and steel construction. In addition the power house will be 40 x 100 ft. In it will be installed a Westinghouse steam turbine and Babcock & Wilcox boilers to generate 1000 hp.

The Connecticut Supreme Court has handed down a decision in favor of the Connecticut River Company, which will enable that corporation to proceed with the erection of a dam across the Connecticut River at Windsor Locks and Enfield, and the establishment of a power plant and electrical transmission system. This project has been under way for several years, but litigation between rival companies has until now prevented the carrying out of the plan. Not only will a large water power be developed, from which electric power will be transmitted for industrial purposes, but a system of locks in conjunction with the dam, will make possible the navigation of the river to Springfield and beyond to Holyoke.

The Industrial Development Company, of the Boston Chamber of Commerce, has been organized under a charter granted by the Massachusetts legislature, to assist in the development of manufacturing in Boston. The company is establishing a guarantee fund of $500,000, which will be utilized under the usual method in guaranteeing the credits of industries with national banks. James J. Storrow, Lee, Higginson & Co., is the president; Thomas F. Beal, the Second National Bank; Colonel William A. Gaston, the National Shawmut Bank, and Daniel G. Wing, the First National Bank, vice-presidents; Russell G. Fessenden, the American Trust Company, treasurer; David F. Edwards, secretary.

The reorganization of the Bay State Brass Company, Haydenville, Mass., has been completed, with F. C. Smith, president; S. S. Cassard, vice-president and secretary, and H. J. B. Willis, treasurer. The business at Haydenville will be continued, including the manufacture of compression bibs, stops and wastes, and ground key work. The company states that it contemplates no addition to the plant or equipment at present.

The New York, New Haven & Hartford Railroad will increase its power plant at Cos Cob, Conn., by an extension having a capacity of four 4000-k.w. turbine-driven generators, of which three will be installed immediately.

The Colt's Patent Fire Arms Mfg. Company, Hartford, Conn., plans to erect a steel addition to its factory.

Lewis Hawthorne, New Haven, Conn., manufacturer of sashes and doors, will erect a new shop building 40 x 150 ft. of brick., mill construction. He states that he will install new machinery throughout.

The R. Wallace & Sons Mfg. Company, Wallingford, Conn., manufacturers of silverware, will erect a power house of reinforced concrete and steel construction, 68 x 86 ft., one and two stories. New boilers and engine will be installed.

Additions to manufacturing plants in New England include the following: Bridgeport Elastic Fabric Company, Bridgeport, Conn., three-story mill building, 58 x 160 ft., with two-story ell; city of Holyoke, Mass., boiler house 30 x 40 ft.; Belfast Building Company, Belfast, Me., addition to the Belfast Shoe Factory; Clark Dye Works, Pittsfield, Mass., dye house; Niantic Menhaden Oil & Guano Company, Niantic, Conn., steel and concrete building, replacing plant recently destroyed

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by fire; Hill & Cutler, Boston, cotton-waste mill at New Bedford, Mass.

The H. B. Ives Company, New Haven, Conn., builders' hardware, will erect an addition 40 x 110 ft., four stories.

The Bay State Belting Company, Salem, Mass., will erect a three-story tannery building of brick and concrete.

Philadelphia.

PHILADELPHIA, PA., June 6, 1911.

The market shows but little tendency toward improvement. Several moderate propositions, which have been before the trade recently have been closed during the week, but as the business was pretty generally distributed it was not much of a factor as far as bringing up the total sales of individual manufacturers and merchants for the past month. Generally speaking, May was a rather unsatisfactory month, in few instances have aggregate sales showed any material gain and in some cases business has shown a decline. Manufacturers are hopeful for an improvement, but with general uncertain conditions in the industrial field the, outlook for any early betterment is not very promising. There has been no fresh inquiry from the railroads located in this vicinity. The demand for second-hand machinery and tools has a tendency to drag. There is an absence of any tool lists of any importance, current business is confined to small lots, principally single tools, and the demand for these appears somewhat less urgent. A very fair amount of boiler and engine business is pending, but orders close very slowly. The foundry trades are, if anything, less actively engaged. In certain classes of work casting plants have fewer orders on their books than has been the case for a long time and plants are being operated on a restricted basis.

Local contractors are estimating on a one-story brick and steel artillery ammunition assembling shop, 58 ft. 6 in. x 258 ft. 10 in., and a one-story brick and steel scrap storehouse, 42 ft. 10 in. x 86 ft. 5 in., to be built for the Frankford Arsenal, this city.

A. L. Rhoads, county controller, Reading, Pa., will receive bids until June 20 for the construction of a reinforced concrete arch bridge to be erected at Kutztown, Pa., including the removal of the present bridge and its re-erection on a new site. Plans and specifications can be obtained at the office of the County Commissioners, Reading, Pa., on payment of a small deposit, which will be refunded on return of the plans.

The Nazel Engineering Works reports a fair demand for special machinery, although less pronounced than was the case some weeks ago. Its plant, however, continues actively engaged, being operated at full time and with full working forces, and sufficient orders are on its books to keep it so engaged for some time. Deliveries of Béché patent pneumatic forge hammers have been particularly good during the last month or two, including among other two 770-lb. hammers for the Flannery Bolt Company, Pittsburgh, Pa.; one 165-lb. hammer for Henry Disston & Sons Company, this city, and one each of the 250-lb. size for the Carnegie Steel Company, Bessemer, Pa., The Boston Elevated Company, Boston, Mass., and Edward Harrington & Son Company, this city.

The Chester Milling Company, Chester, Pa., whose plant was recently destroyed by fire, contemplates the erection, it is reported, of a substantial structure to replace its late plant. Details are not available at this time, but it is understood that plans call for a steel and concrete building.

The Light Mfg. & Foundry Company, Pottstown, Pa., advises that the demand for its product is increasing and it is looking forward to having a normal production during the next month or two. Business in hand is quite satisfactory.

The Board of Awards, Baltimore, Md., has ordered that new specification for proposals for a 30,000,000-gal. pump for the Mount Royal Pumping Station, in that city, be prepared. It is understood that the changes suggested do not affect the previous specifications as to the pump itself, but refer more particularly to the method and apportionments of the payment to be made.

The Chadwick Engineering Company, Pottstown, Pa., advises that the demand for automobiles has opened up much earlier than usual. A steady flow of orders has been coming in and the outlook for further business is very encouraging. This company calls particular attention to the fact that inquiries from abroad are increasing and several sales are reported, including a large automobile shipped to a customer in Argentine Republic, with a second to follow at an early date.

City Councils, of Philadelphia, has apportioned an expenditure of $2,300,000, made available by a recent special election, approving such a loan, by which the Bureau of Water will receive $525,000 for the completion of the Queen Lane Filtration Plant; the Bureau of Surveys $325,000 for new sewer work; the Bureau of Highways $500,000 for the Torresdale Boulevard and $600,000 for new street work, while the Bureau of City Property receives $250,000 for the improvement of League Island Park.

Murphy & Lewis is a new partnership, with offices in the Land Title Bilding, Philadelphia, composed of E. T. Murphy and A. T. Lewis. The new company was formed to act as sales engineers for the Buffalo Forge Company, Buffalo Steam Pump Company and Carrier Air Conditioning Company, in the territory formerly handled by E. T. Murphy.

Cleveland

CLEVELAND, OHIO, June 6, 1911.

Local machinery houses report a little more activity in the volume of inquiries during the past few days, a few manufacturing plants having come into the market for small lots of tools. The largest inquiry is from an Akron rubber tire manufacturer, who has an inquiry out for three lathes and a few other tools, in all aggregating about $8,000. There is a fair demand for second-hand tools, but these are not bringing very satisfactory prices. While the general outlook shows little change, there is a feeling that the reduction in steel prices will prove beneficial to some lines of the machinery trade. There is a fair amount of prospective business that has been held up for some time, buyers waiting until business conditions are brighter.

The demand for cranes is more active, some good orders having been placed with manufacturers in this territory during the past few days. The demand for electric motors and generators is fairly good. Manufacturers of power plant and other equipment are getting quite a satisfactory volume of business from various manufacturing plants outside of the metal working lines.

A list of machine tool requirements for the manual training department of the Public South High School, Akron, Ohio, has been issued by H. V. Hotchkiss, superintendent of schools in that city. The list includes 15 10-in. woodturning lathes with 4-ft. bed, 15 lathe benches, one 30-in. band saw, one circular saw bench, one power grind stone mounted with 30 x 5-in. stone, one wood trimmer and a large list of small tools and other small equipment for the forge room and the wood working and pattern making departments. It is expected that orders for this equipment will be placed shortly.

Specifications have been completed for the power equipment for the new West Side Technical High School, Cleveland, for which bids will be received June 12. The equipment will include 4 horizontal tubular boilers, 4 automatic stokers, 3 direct-connected generating units, 1 50-kw. and 2 125-kw., three motors for plenum ventilating fans and 10 or 12 2 to 5-hp. motors for the exhaust fans. At the same time bids will be received for the heating and ventilating systems.

The Massillon Wire Basket Company, Massillon, Ohio, which was recently incorporated, has purchased the property of the Munger Wire Basket Company and will continue the manufacture of wire baskets for various purposes. The company expects to erect additional buildings to enlarge its plant.

The Youngstown Carriage Company, Youngstown, Ohio, has awarded a contract for the erection of a new three-story factory building, 100 x 150 ft., of brick and three stories.

Preliminary plans have been completed for the erection of a new plant to be erected by the American Can Company in Toledo, Ohio, that will cost, approximately, $350,000. Two buildings of steel, reinforced concrete and brick will be erected. George S. Mills, Toledo, architect, is preparing the plans.

The Strainer Company, Cleveland, has been incorporated with a capital stock of $10,000 by A. A. Neiger, L. B. Spanner, E. W. Miller and others to manufacture straining and filtering devices.

With a capital stock of $40,000, the Cleveland Calculating Machine Company has been incorporated by E. A. Grant, C. J. C. Grant, A. S. Dennis, J. F. Pease and W. L. Flory.

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The Great Lakes Welding Company, Cleveland, has increased its capital stock from $20,000 to $50,000.

The Canton Casting Company, Canton, Ohio, has been incorporated with a capital stock of $30,000 by L. E. Shull, W. A. Strayer, L. A. Buchanan, O. F. Kwiatt and A. J. Hill.

The Northern Ohio Traction & Light Company, which has commenced the erection of a new power house at Cuyahoga Falls, Ohio, will also build a car repair shop at that point.

The Universal Machine Company, Toledo, Ohio, has increased its capital stock from $25,000 to $100,000.

Cincinnati

CINCINNATI, OHIO, June 6, 1911.

There is some intermittent buying of machine tools on the part of the general trade, but the aggregate of orders coming in is disappointing. Inquiries are also scarce, and several more machine tool builders have decided to run on shorter time rather than pile up large stocks. A few, however, report order books in shape to enable them to continue operating up to capacity. As a rule, present buyers are said to be after the lower priced tools, and this has undoubtedly helped out the second-hand dealers, who are, comparatively speaking, doing a fair business.

Activity in the building trades has benefited the supply and hardware houses; manufacturers of valves and fittings also continue their optimistic reports. Boilers and tanks, especially of the larger sizes, are not in demand, but there is considerable repair work being done in this line.

The Domestic Science Baking Company, a new Cincinnati incorporation, has broken ground for what is intended to be one of the most modern baking plants in the country. The building will be about 200 x 200 ft., two stories and of concrete construction. The machinery will be driven by individual electric motors, which are yet to be provided for. F. W. Niebling, of the F. W. Niebling Company, Norwood, Ohio, has the machinery plans in charge.

The American Foundry & Machine Company, Hamilton, Ohio, has commenced work on a foundry addition that will be 100 x 117 ft., one-story, and also a three-story pattern shop 30 x 100 ft. Both buildings will be of reinforced concrete construction.

Cincinnati manufacturers have lately been receiving some excellent business from the Japanese Government. Among recent orders reported from this source is one for a lot of the United States Electrical Tool Company's latest type electrical grinders for use in a navy yard shop.

McGarvey & Co., Gerke Building, Cincinnati, have been awarded the contract for the construction of the large car barns to be erected at Winton place, for the Cincinnati Traction Company.

The Concrete Steel Company, Cincinnati, has been awarded the contract for the construction of a large reinforced concrete building at Columbus, Ohio, for the Citizens Wholesale Supply Company. The estimated cost of the proposed structure is over $100,000.

The Universal Machine Company, Toledo, Ohio, has increased its capital stock from $25,000 to $50,000, and will probably add to its factory facilities for the manufacture of marine motors and other specialties.

The Massillon Wire Basket Company, Massillon, Ohio, whose incorporation was recently mentioned, has plans under way for adding to the old plant of the Munger Wire Basket Company, which was acquired by the new company.

George U. Marvin, secretary of the Board of Managers Ohio Penitentiary, Columbus, Ohio, will open bids June 26 for equipment for a stone-crushing plant and quarry. Specifications are on file at the offices of Marriott, Allen & Hall, architects, Columbus.

The Cincinnati Tobacco Machinery Company, Cincinnati, is a new incorporation, with $50,000 capital stock, for the purpose of manufacturing special tobacco machinery. The incorporators are: W. J. Friedlander, Louis A. Hauck, F. S. Baldwin, Oscar Berman and Aaron Grodsky. W. J. Friedlander, the principal incorporator, is president of the Hisey-Wolf Machine Company, Cincinnati.

Announcement is made by Postmaster General Frank H. Hitchcock that bids will be opened in Washington, June 22, for the construction of a 30-in. pneumatic tube from the post office in Cincinnati to the Union Station.

The recent increase in the capital stock of the Ohio Electric Car Company, Toledo, Ohio, from $150,000 to $250,000, is said to mean some extensive additions to its present facilities.

Although currently reported, Herman Schneider, dean of the Engineering Department, University of Cincinnati, will not accept the presidency of a Western college, recently offered him, but has definitely decided to continue his work with his present institution.

Chicago

CHICAGO, ILL., June 6, 1911.

A week of decided quiet has prevailed in almost every branch of the machinery trade. The closing of even the lesser inquiries is long drawn out and railroad lists that have been out for one and two months are still pending. Scattering orders are of a desultory character, and floor sales are few and not especially attractive. One list issued by the Atchison, Topeka & Santa Fe has been purchased, the majority of the buisiness going to the two principal makers of heavy railroad tools. A second list of tools from this road is still open. Bids on a small list from the Chicago, Rock Island & Pacific close on the 6th inst. The International Harvester Company purchased tools for its Deering plant to the amount of from $4,000 to $5,000, but has not yet closed for its Milwaukee plant requirements. The machinery to be bought by the American Steel & Wire Company, for its various plants to the aggregate amount of $70,000, continues to be the most important item of interest.

The Joliet Sand & Gravel Company, Joliet, Ill., and Fisher Building, Chicago, is having a crusher plant constructed at its works at Mount Flathead.

Sheboygan, Wis., is considering improvements to its waterworks system to cost about $50,000.

The Gisholt Machine Company, Madison, Wis., has awarded contracts for improvements to its plant, the cost of which will be $155,000. Of this amount $40,000 will be for an office building, and the balance for shops. Part of the shop will have a gallery and the entire building will be modern in every respect and of fireproof construction.

The city of New London, Iowa, is rebuilding its light plant which was recently destroyed by fire. A modern plant will be installed, for which purpose bonds in the sum of $9,000 will be issued.

The Francis Light & Power Company, Francis, Okla., has been incorporated with $10,000 capital stock. Contracts for the installation of the plant have not been let. W. L. Shaffer is vice-president of the company.

Liberal, Kans., is having estimates prepared for a $30,000 water-works system.

Detroit

DETROIT, MICH., June 6, 1911.

Industrially business has been very quiet the past week, in fact more subdued than has been the case for any week since March. Orders for new machines from motor car manufacturers have been much below the average maintained so far this year. No fears are held, however, by the makers or by the accessory men, the lull being attributed to the touch of midsummer weather. Sufficient orders are on hand by most of the companies throughout the state, to keep the plants running far into the fall. Building operations are very active, two large hotels being planned for immediate erection. Several factory additions are under way.

David Stott, of this city, has purchased a large piece of property on Wayne and Michigan avenues, where he will erect a 12-story hotel to cost $1,000,000. The building will be modern in every particular and will be one of the largest in the city.

W. C. Durant and Louis Chevrolet are to sever their present business connections and establish a large factory in this city for the manufacture of a new high-priced car, designed along lines advanced by Louis Chevrolet. The new concern will be financed by Mr. Durant, who has been drawing away from the General Motors Company for several months.

Considerable structural steel will be used in the building of the newly-planned auditorium and hotel, for which a company has been organized this week. The auditorium will seat 9000, and the hotel will contain 700 rooms. The building will occupy a whole block, will be nine stories and will cost about $2,000,000. Par-

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ticulars are to be had from the Board of Commerce.

With the idea of increasing its plant capacity and enlarging its business, the Independent Stove Company has increased its capital stock from $175,000 to $225,000. The company has been enjoying a big business the past year.

The Commerce Motor Car Company, incorporated a short time ago, with a capital stock of $10,000, has found this amount of capital stock inadequate and has increased it to $25,000.

One more addition to the long list of motor car concerns of this city is the Redshield Hustler Power Car Company. The company has been incorporated with a capital stock of $40,000, and will start operations in a property costing about $20,000.

The Detroit Power Apparatus Company was organized this week with a capital stock of $50,000, to manufacture machinery parts and machine tools. The company takes a prominent part among the machinery manufacturers of this city.

A new company has been organized at Muskegon, Mich., under the name of the March Tenney Company, to manufacture drinking and soda fountains. The capital stock is $30,000, of which $20,000 is paid.

Morril & Morely, dealers in spray pumps, have merged their business into a stock company under the name of the Morril & Morely Mfg. Company, with an authorized capital stock of $10,000.

An auto accessory concern was organized at Lansing this week with the title of the Haigh Auto Light Company. The company will make a patent automobile lamp. The capital stock is authorized at $5,000.

The J. F. Hartz Company, dealer in surgical instruments, has increased its capital stock from $30,000 to $250,000. The company's business has increased by leaps and bounds the past year, and the increase will allow an expansion of the company's affairs.

The General Motors Company has filed articles of incorporation with the secretary of state with a capital stock of $60,000,000. The new incorporation is a holding company for the company in New Jersey.

As a result of increase in business, the Armour Grape Juice Company, Mattawan, Mich., near Kalamazoo, will erect a large addition to cost in the neighborhood of $10,000. This addition 100 x 100 ft. will give the plant a capacity of 300,000 gal. per year. New apparatus, consisting of pressers, sterlizers and other machinery connected with the business, to the amount of $25,000, will be purchased.

The Terril Equipment Company, Grand Rapids, whose plant was totally destroyed by fire a few weeks ago, will erect a new building to cost about $20,000 on the grounds of the old plant. Other buildings are in course of erection.

The Hardware Supply Company, Grand Rapids, Mich., has filed a trust mortgage with the city clerk, for $10,000, to cover the cost of purchasing new machinery. The mortgage covers the stock and fixtures of the company.

The Belknap Wagon Works, Grand Rapids, suffered from a fire last week that destroyed the boiler room and the dry kilns above. The loss will reach about $5,000.

Fire destroyed part of the plant of The Brunswick-Balke-Collender Company factory as Muskegon, Mich., causing a loss of $25,000. The fire was mainly confined to the chemical plant.

The Snyder-Fuller Furniture Company, Grand Rapids, as an outcome of the recent labor troubles in that city, will move its plant to Lake Odessa, Mich. A suitable building will be remodeled and some new equipment installed.

The Dudley Tool Works, Menominee, Mich., will build a new addition to its plant and will purchase the necessary machinery equipment. The building will be about 100 x 140 ft.

The Kalamazoo Washer Company has been organized with a capital stock of $20,000 to succeed the Minute Washer Company, Kalamazoo, Mich. Fred A. Mills remains as president.

The Kalkaska Handle Company, organized to manufacture handles of all descriptions, has filed articles of incorporation with the Secretary of State. The company will be located at Kalkaska, Mich., and has a capital stock of $12,000.

A specialty manufacturing company has been organized at Plymouth, under the style of the Bennett Mfg. Company, and has a capital stock of $20,000.

The American Oil Engine Company is the name of a company which, in all probability, will move to the city of Port Huron. The concern is a large and important organization and will be a big addition to the city's list of industries.

The Council of the city of Big Rapids has reported in favor of a new gas plant, instead of spending $25,000 in improvements to the old plant.

The village of Newberry, Mich., will submit to the vote of its citizens the proposition of bonding for $11,500, to cover the cost of making additions and improvements to the city power plant. Of this amount it is planned to spend about $4,000 in new machinery.

W. F. Woodhouse and Charles Tirolli, secretary and treasurer of the newly organized Michigan Adjustable Hub Company, Bay City, have secured 15 acres of land on which to construct their buildings. The company expects to employ about 1000 men.

The Michigan Glass & Bottle Company is erecting a large addition to its plant at Saginaw, which it is expected to rush to completion by July 10.

The city of Saginaw, Mich., has secured an important industry in the Central Cut Glass Company, Chicago. The company has a capital stock of $4,100,000, and in making the move will transfer 100 mechanics with their families. A large plant will be built at the above city and the company will increase its output considerably.

The Golden Rule Hay Press Company, Kalamazoo, Mich., and the Business Men's Paper Press Company, Wayland, Mich., have consolidated, will very soon incorporate under a new name, and are now looking for the most favorable site on which to erect a large factory, and will consider the advantages of any locality. George F. Woodward, 945 Austin street, Kalamazoo, can be addressed.

Indianapolis

INDIANAPOLIS, IND., June 6, 1911.

The Traffic Club of the Indianapolis Trade Association has elected W. M. Young, traffic manager of the Nordyke & Marmon Company, president. He has been chairman of the Indianapolis Committee of the National Association of Automobile Manufacturers for three years. The Traffic Club is an organization composed of traffic managers and shipping clerks connected with the industrial and mercantile concerns of the city. H. S. McNeely is secretary.

The Indianapolis Wire Bound Box Company has increased its capital stock from $5,000 to $10,000.

The Indianapolis Envelope Company, Indianapolis, has been incorporated with $125,000 capital stock, to manufacture envelope machinery and envelopes. The directors are: Herman Hoster, W. B. Emerson and H. B. Mahan.

The Benson Mfg. Company has been incorporated at Owensville, Ind., with $25,000 capital stock, to manufacture agricultural implements. The directors are: W. E., J. E. and B. F. Benson.

The Fulwider-Bedford Quarries, Clear Creek, Ind., has been incorporated with $100,000 capital stock, to quarry stone. The directors are: O. M. Fulwider, H. H. Underwood, William Graham, J. W. O'Harrow and G. D. Thornton.

The Carlisle Gas Company, Carlisle, Ind., has been incorporated with $10,000 capital stock, to manufacture artificial gas. The directors are: W. F. Dodge, C. B. Willis, J. G. Frazee, Joseph Hume and E. W. Rogers.

The Rushville Furniture Company, Rushville, Ind., has been incorporated with $30,000 capital stock, to manufacture furniture. The directors are: William E. Havens, A. S. Riggs and A. L. Stewart.

The Consolidated Light & Power Company has been incorporated at Hazleton, Ind., with $35,000 capital stock, to supply light and power. The directors are: Ethelbert Curtner, Jesse Doty and J. T. Breithaupt.

The Henry Mfg. & Grease Cup Company, Terre Haute, Ind., has been incorporated with $40,000 capital stock. The directors are: J. P. Gilmour, Michael Henry, Michael L. Henry, Jon Marmor and Charles Fox.

The Wayne Knitting Mills, Ft. Wayne, Ind., has increased its capital stock from $1,000,000 to $1,200,000.

The burning of the factory of the Northwestern Can Company at Chicago is hastening the completion of the company's factory at Brazil, Ind., the main building of which is 100 x 700 ft.

The Connersville Furniture Company, Connersville, Ind., has increased its common stock from $75,000 to $150,000, and has issued $75,000 of preferred stock.

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Goshen, Ind., has raised a bonus of $10,000 cash to induce the removal of the Stephenson Mfg. Company from South Bend to Goshen. It manufactures knit woolen goods. It will be established in a building formerly occupied by the Goshen Rubber Company, and an additional factory will be built.

The Goshen Veneer Company, Goshen, has increased its capital stock $10,000. C. E. Gorman is president of the company.

The plant of the Home Heating Company, Anderson, Ind., was sold at receiver's sale to the Anderson Trust Company, trustee, and will probably go to a newly organized company which proposes to install a larger steam-heating plant.

The Anderson Gas Company, Anderson, Ind., has awarded a contract for the installation of an artificial gas plant.

The Huntingburg Furniture Company, Huntingburg, Ind., recently incorporated, has had plans prepared for a building, 60 x 250 ft., one story and basement, of modern brick construction, to contain dry kilns, etc. The building will be equipped with modern appliances operated by steam power.

The South

LOUISVILLE, KY., June 6, 1911.

Some improvement in the machinery situation is reported locally, and conditions throughout this territory are becoming more active. There is a fair demand for power equipment, while machine tools, as the result of the equipment of a number of small shops, has taken on temporary life, which it has been lacking for some time. The demand for refrigerating machinery is good, an active export trade having been reported. Pumps and other equipment for installation in breweries and distilling plants are also being sold in good volume.

The annual convention of the Kentucky State Association of Stationary Engineers was accompanied by an exhibit of machinery and supplies which was held in Liederkranz Hall, Louisville, June 2 and 3. Among the exhibitors were the William Powell Company, Cincinnati, valves; National Smoke Preventer Company, Louisville; Moran Steam Flexible Joint Company, Louisville; James Clark, Jr., Electrical Company, Louisville; Henry Vogt Machine Company, Louisville; Jenkins Bros., New York, valves; Lyons Boiler Works, DePere, Wis.; Wicker Boiler Company, Saginaw, Mich.; V. D. Anderson Company, Cleveland, steam traps; Ahrens & Ott Mfg. Company, Louisville; Hills McCanna Company, Chicago, force feed lubricators; Osborne High Pressure Joint & Valve Company, Chicago; J. J. Reilly Mfg. Company, Louisville, pumps, and Strong, Carlisle & Hammond Company, Cleveland, valves, in addition to a number of dealers.

The Henry Vogt Machine Company, Louisville, is contemplating the erection of an addition to its boiler department and may be in the market for a considerable amount of equipment for it a little later on. Meanwhile the company is planning the purchase of two or three steam drop forge hammers of 1000-lb. and 2000-lb. capacity, in place of the single piece of equipment it was originally reported to be in the market for. The company reports a fair demand for boilers, while several large sales of refrigerating machinery have been made. Two complete plants have been sold for delivery in British East India, while several other foreign orders have been booked lately.

The Electric Vehicle Company, Louisville, has leased the building formerly occupied by the American Clothing Company at Preston and College streets, and is installing equipment for the manufacture of cars. The capacity will be limited at first to three cars a week, including passenger-carrying and frieght vehicles, the latter to be a 1000-lb. wagon. Later the capacity is to be increased. The company is incorporated with $10,000 capital stock, but will probably increase this later. Among the machines installed have been a grinder of the Cortland Carborundum Wheel Company, an automatic saw of the Diamond Saw & Stamping Company, and a shaper of the Smith Mills Company. These pieces were sold by E. D. Morton & Co., of Louisville. Louis Ruthenberg is superintendent of the plant.

The Frederick Ruggles Mfg. Company, maker of automatic bottle filling machines, has moved its plant from 188 State street, Louisville, to Main street near Second, and has installed some new machinery, including a Century Electric Company motor, a Cisco lathe and a Stewart Standard furnace manufactured by the Chicago Flexible Shaft Company, the latter piece being for the brass foundry. The output of the company is sold through the Simplex Bottle Filling Machine Company, Baltimore, Md.

The J. J. Reilly Mfg. Company, Louisville, maker of pneumatic pumps, has recently installed equipment in the plant of the Falls City Brewery, Louisville, and the distillery of W. A. Gaines & Co., at Frankfort, Ky.

The Multiple Sign Company has filed articles of incorporation in Louisville with $10,000 capital stock for the manufacture of metallic signs. A. C. Bowen, John C. Hughes, George T. Wood and others are the incorporators.

The Falls City Construction Company, Commercial Building, Louisville, has been given the general contract for the construction of a 10-story building at Center and Jefferson streets, Louisville. The building will involve a considerable tonnage of structural material, and the general contractor will let a subcontract for the erection of the iron work. The total cost of the building will be $100,000, and a good deal of equipment, including elevators, etc., will be required.

The Jeffrey Mfg. Company, Columbus, Ohio, has secured the contract for the installation of a considerable amount of conveying machinery in the coal elevating plant of E. T. Slider in Louisville. The sale was made through Fred Wehle, the company's local representative.

The George G. Fetter Lighting & Heating Company now has its new plant in operation. Practically all the machinery for it was installed by the Westinghouse Bachine Company. The equipment consists of two 300-kw. generators, a 200-kw. generator, two 100-kw. generators, four Ridgway engines and a Parsons low pressure turbine. Westinghouse motors were also installed in connection with the various divisions of the refrigerating plant. J. Hoadley Cochran is chief engineer of the company.

Peter M. Andriot & Son, 215 West Green street, Louisville, are planning the installation of additional forges in their blacksmithing department, as well as a gas machine for heating and lighting purposes. They manufacture delivery wagons.

The Louisville Wheel Company, at Fifteenth street and St. Louis avenue, has installed a spoketurning department. Equipment for it was furnished by the Defiance Machinery Company, Defiance, Ohio.

The Luton Coal Company, Providence, Ky., which recently incorporated with $100,000 capital stock, will begin work immediately and will install a good deal of new machinery.

E. K. Hitchens, of the Olive Hill Fire Brick Company, Olive Hill, Ky., will establish a plant for the manufacturer of fire brick in Carter County, Ky.

James H. Reed, Lexington, Ky., and associates will establish a plant for the manufacture of asphalt paving. The estimated cost of the plant is $12,000.

George H. Johnson, Madisonville, Ky., is organizing a company at Greenville, Ky., for the purpose of erecting a large flour and meal milling plant.

The Petersburg Electric Light & Power Company, Petersburg, Tenn., has filed articles of incorporation with $21,000 capital stock, A. C. Davis and George McAdams being among the incorporators. It will erect a lighting plant at once.

The Tennessee Stove Works, Chattanooga, Tenn., has amended its charter, increasing its capital stock from $50,000 to $100,000. J. L. Caldwell, Joe H. Caldwell, B. B. Davenport and others are incorporators.

B. C. Jarrell & Co., Humboldt, Tenn., veneer manufacturers, have completed the installation of a 100-in. rotary veneer machine with clipper and knife grinder. The equipment was manufactured by the Capital Machine Company, Indianapolis.

The Chattanooga Estates Company, Chattanooga, Tenn., through C. E. Jones, has announced the completion of arrangements for the construction of a cement plant with 9000 barrels capacity. Chicago capital will be interested, according to Mr. Jones' statement.

The American Foundry & Supply Company has been organized at Asheville, N. C., with $50,000 capital stock, taking over the plant of the Sternberg Supply & Foundry Company. New buildings for foundry and machine-shop work will be erected and considerable equipment will be required. The plant will be completed in September.

The Interstate Agricultural Corporation has announced plans for the erection of a $100,000 acid plant for the manufacture of a preparation to be used in making commercial fertilizer at Americus, Ga.

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The Fletcher Guano Company, Augusta, Ga., is having an addition built to its fertilizer plant. The cost of the building and equipment will be $20,000.

F. Lynn Brown, Chicago, Ill., is reported to be planning the erection of a gas plant at Moss Point, Miss. The estimated cost of the proposed plant is $150,000.

F. S. Twitty and others are planning the construction of a hydroelectric plant at Columbia, Ala. The cost of the plant will be $8,000, according to present plans.

The Champion Lumber Company, a New Jersey corporation, is planning the erection of several large band mills near Canton, N. C. The plants will be operated in connection with wood pulp mills which are now running.

The Hattiesburg, Miss., Traction Company is planning some new financing to enable it to make a number of improvements in its equipment and to extend its lines.

The Georgia School of Technology, Atlanta, Ga., has in course of erection a building to contain smith ship, foundry, general locker and toilet rooms, library room and administration offices. Further plans include other additions to contain a machine shop and a woodworking shop which will require considerable additional machinery. These buildings will be erected later on. Francis P. Smith, who is connected with the school, is the architect.

The United Wells Works, Stuttgart, Ark., has awarded a contract for the sinking of a 1500-ft. artesian well at Blythesille, Ark., and is in the market for 1500 ft. of 8-in. wrought iron steel pipe weighing not less than 28 lb. to the ft.

St. Louis

ST. LOUIS, MO., June 5, 1911.

The manufacturing plants of the Sodemann Heat & Power Company in St. Louis and Edwardsville, Ill., which have been taken over by the United States Radiator Corporation, will be refitted with modern machinery equipment for the handling of the trade in the St. Louis territory.

Brauer Bros. Mfg. Company leased new quarters this week at Fourteenth and Pine streets and will at once enlarge its equipment for the manufacture of all kinds of leather sporting goods and dog collars.

The Automobile Gas Generator & Motor Company, St. Louis, incorporated the past week with $50,000 capital stock, will engage in the manufacture of lighting devices for automobiles and will also manufacture motors and cars.

The Moberly Paving Brick Company, of Ohio, has been licensed to use one-half its capital in Missouri and will establish a plant at Moberly, Mo., fully equipped with modern brick-making machinery.

The Western Refrigerator & Mfg. Company, of St. Louis, has increased its capital stock from $12,000 to $25,000 and will increase its mechancal capacity for the manufacture of refrigerating machinery.

The Swedish Metal Company, with $50,000 capital stock fully paid, has been incorporated here by George G. Hadley, Charles F. Reals and Wilson D. Hoyt to manufacture metal wares of various kinds.

The Newburg Tripoli Company, Newburg, Mo., has been incorporated with $50,000 capital stock by Henry P. Siegel, C. T. Dana and L. M. Finley, to engage in the manufacture of filters, utilizing a stone recently discovered at Newburg.

The Diamond Jack Mining Company, Carterville, Mo., incorporated this week by L. S. Connor, Frank P. Blair and O. L. Robbins, is reported to be in the market for a full equipment of zinc and lead mining machinery and other mechanical facilities for the work.

The Laclede Steel Company, with $100,000 capital stock, has been incorporated in St. Louis by William E. Guy, George D. Markham, George O. Carpenter, L. R. Carter, J. H. Smith, Joseph W. Lewis and Thomas R. Akin. This is preliminary to an increase of capital to $500,000, which will be utilized in the construction at once of a modern and fully equipped steel plant. Options for locations cover sites in both St. Louis and East St. Louis.

The Eagle Mfg. Company, Kansas City, Mo., will in the near future erect a factory in Muskogee, Okla., details of which have not been decided upon.

Eastern Canada

TORONTO, ONT., June 3, 1911.

The immigrants who are now pouring into Canada are by no means all farmers. There is a large infusion of artisans, who, like the majority of the farmers in the movement, came from the United States. Slackness in the iron and steel industries of the United States is responsible for a considerable influx of skilled workers who had found employment in those industries. These are very welcome. Skilled labor has been at a premium here for some time. The influence of the labor union has been adverse to the immigration of such workers from the other side of the Atlantic, the Government requiring that all wageearners from abroad, except those coming to work on the farms, should have a minimum amount of money upon their arrival. Skilled laborers were not disposed to come in large numbers from the United States until conditions at home changed somewhat for the worse. In most manufacturing industries here labor is still scarce, factories having more business on hand than they can attend to with the present supply of workers. The cut in steel continues to have a favorable effect on trade in all lines using steel as raw material, the demand for equipment, machinery, etc., being so urgent that no one thinks of trying to ease down operations on the chance of stocking up at still lower prices.

A feature of the trade is the sudden developmnt of new business. This is a consequence of the swarming in of new population with large collective buying power. A colony will be established by a few trainloads of settlers, and at once plants of various kinds becomes called for to provide for commercial needs of the settlement. Of course Canadian manufacturers have not all the new business to themselves. American competition is reported to be keener and harder to meet than ever. But there is trade enough for the Canadian plants. They were never busier. All the indications give ground for expecting the biggest year's trade the country ever had. Unless all the signs fail, there will be quite wonderful advances here in the next twelvemonth. The country has reached a stage at which the large forward movements of the past look small. Great enterprises spout up in a night. A reason for the relatively phenomenal progress that is proceeding is the present organization of capital. Under the auspices of certain powerful groups of men new undertakings spring up as if by magic, whereas a few years ago their coming forth would be attended by pains.

The Canadian Government is receiving sharp criticism on behalf of the British Empire Bridge Company for the awarding of the Quebec Bridge contract. The company—a Canadian corporation of which the components were certain British engineering companies—put in the lowest tender for the work as called for by the official design, but the contract was awarded to the St. Lawrence Bridge Company upon a tender for a different design.

The first shipment was made this week from the new concrete pier of the National Iron Works, Toronto. It consisted of 2500 tons of cast-iron pipe, running from 4 to 20-in. in diameter, and was consigned to the Winnipeg Gas Company, Winnipeg, and the Waterworks Department of Souris, Man., and Moose Jaw, Sask. A boat will leave the company's dock twice a week with pipe for points in the West.

The Department of Railways at Ottawa has completed arrangements for the beginning of construction on the Nova Scotia branch lines of the Intercolonial Railway.

The Wyagamack Pulp & Paper Company, Three Rivers, Que., will shortly make a large capital issue to be applied in the construction of plant.

N. Curry, president of the Canadian Car & Foundry Company, announces that $200,000 will at once be spent in extensions of the company's plant at Montreal. At present the works turn out about 70 cars a day. The output is to be raised to 100 cars.

The ratepayers of St. Catharines, Ont., have given their approval to the agreement between the municipal corporation and the Canadian Yale & Towne Company for the establishing of the latter's works in the city. The company has now a force of men at work in the city making dies for the manufacture of Yale locks and other articles.

The mines of the Moose Mountain Iron Company at Sellwood, Ont., have been closed down, 250 men being

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thrown out of employment. This is said to be on account of dulness in the iron and steel industries of the United States. The company is to begin work very shortly on a concentrating plant to cost $300,000.

The Eastern Power Company has been incorporated under Ontario laws. It is stated that it will construct another plant on the Trent River, Ont. It is believed to be a subsidiary of the Electrical Power Company, which controls so many power enterprises in central Ontario.

The Superior Rolling Stock Company has been incorporated by parties connected with the Lake Superior Corporation. It will manufacture locomotives, cars, etc., at Sault Ste. Marie, Ont.

The Canadian Electric Welding Company, headquarters Montreal, has been incorporated as a Dominion undertaking with $500,000 capital stock.

Damage estimated at $50,000 was done by a fire at the Lake Superior Corporation's coke ovens at Sault Ste. Marie, Ont., on May 29.

The ratepayers of Guelph, Ont., have approved a by-law to loan the Independent Fire Company $20,000 to start up business there.

At its annual meeting in Hamilton, Ont., this week, the Steel Company of Canada elected the following directors: C. S. Wilcox, Hamilton, president; Charles Alexander, Providence, R. I.; Hamilton Benn, London, England; Lloyd Harris, M. P., Brantford; H. S. Holt, Montreal; W. D. Matthews, Toronto; Hon. William Gibson, Beamsville; Cyrus A. Birge, Robert Hobson, William Southam and John Milne, Hamilton.

The Oliver Chilled Plow Company, Brantford, Ont., has awarded contracts for two more large buildings. The contracts went to an American firm.

Vickers Son & Maxim, shipbuilders, England, have applied to incorporate their Canadian company as a British concern with a capital stock of a million sterling.

The National Paper Company has been incorporated at Ottawa with a capital stock of $100,000, Montreal to be the chief place of business.

The Canadian Pacific Railway Company has taken out a permit to build a roundhouse at London, Ont. New repair shops are to be built there by the company in the autumn.

In the fiscal year ended with last March, $528,857 was paid in bounties on wire rods. The pig-iron bounties amounted to $261,453 and the steel bounties to $350,455. The latter two bounties expired in December.

It is announced that the Canadian Northern Railway Company will at once call for tenders to construct the section of its line around the north shore of the upper Lakes from Sillwood, near Sudbury, to Port Arthur, a distance of 500 miles.

A by-law to expend $25,000 on the municipal hydro-electric distributing system was carried by the ratepayers of Galt, Ont.

The Riverside Motor Company, with head office at Walkerville, Ont., has been incorporated under Ontario laws with a capital stock of $40,000.

Tenders for extensive harbor terminal improvements to be made at Halifax, N. S., are being called for by the Canadian Department of Railways, Ottawa. The total estimated cost is $2,000,000. An appropriation of $600,000 for the purpose was passed before Parliament rose.

The Otonabee Power Company, Peterborough, Ont., proposes to spend $200,000 upon new plant.

The Dominion Flour Mills, Ltd., has been incorporated with a capital stock of $1,500,000, the head office to be in Montreal. A 2000-bbl. mill is to be built at Lachine, Montreal.

The Hull Electric Company, Hull, Que., will spend $25,000 on new car sheds and repair shops.

Very extensive harbor improvements will soon be begun at St. John, N. B., by the Department of Public Works at Ottawa.

The Rhodes-Curry Company will rebuild the part of its plant at Amherst, N. S.

The N. B. Foundry plant at Fredericton, N. B., was destroyed by fire, causing a damage of $50,000.

The ratepayers of Ingersoll, Ont., have carried a by-law to fix the assessment of the John Marrow Screw Company, which will put up an additional plant to cost $150,000.

The Burton Saw Company, Vancouver, B. C., is negotiating with the City Council of Moncton, N. B., in regard to locating there.

The Dominion Corset Company, and Carabello Carriage Company, Quebec, Que., were damaged by fire. The estimated losses aggregate $250,000.

The Massey-Harris Company, manufacturer of agricultural implements, is completing plans for a three-story addition, 60 x 180 ft., to be made to its plant in Brantford, Ont.

O'Keefe & Drew are erecting a meat-packing plant in Chatham, Ont., to cost $80,000.

W. E. Jennings, a manufacturer in Birmingham, England, is considering the question of establishing a factory at Niagara Falls, Ont.

The Light Commission of Berlin, Ont., has decided to ask for $20,000 to be expended upon additions to the municipal electrical system.

The Chatham Cement Tile Works Company will build a factory and begin manufacturing operations in Chatham, Ont.

Western Canada

WINNIPEG, MAN., June 3, 1911.

The Prince Rupert Hydro-Electric Company is the title of a company incorporated under Dominion laws, whose capital stock is to be $5,000,000 and principal place of business Prince Rupert, B. C. Charles H. Canan, K. C., and H. A. Lovett, K. C., are prominent Montreal men connected with it. The former is president of the Western Canada Power Company. Twenty-five thousand horse-power is to be developed on branches of the Skeena River.

The Railway Department at Ottawa is now calling for tenders for the construction of the first 185 miles of the Hudson Bay Railway. The contract will be open till August 1.

The ratepayers of Medicine Hat, Alberta, have voted in favor of the by-laws to grant to the Alberta Foundry & Machine Company and to the Glass Company a free site and 250,000 cu. ft. of of gas per day to each. D. C. Cameron, Winnipeg, is behind the glass project. Next month the ratepayers will vote on by-laws to grant sites to the Preston Planing Mills, the Gardon Nail Mills and the Medicine Hat Milling Company.

The Roberts Filter Mfg. Company, Philadelphia, will install a water filtration plant at Saskatoon for $55,890.

A by-law to expend $300,000 on the sewer system of Victoria, B. C., has been approved by the ratepayers.

Up to July 1 tenders will be received by the Bow River Bridge Company, Calgary, Alberta, for the construction of a three 100-ft. span, steel traffic bridge.

The Grand Trunk Pacific Railway Company will erect a building in Victoria, B. C., to cost $300,000.

Ald. Rogers is building a 10-story structure in Vancouver, B. C., to cost $500,000.

The Norton-Griffiths Steel Construction Company has the contract to erect a filter house for the B. C. Sugar Refining Company, Vancouver, B. C., to cost $80,000.

The Nicola Valley Coal & Coke Company, Vancouver, B. C., has given to Roberts & Schaefer, Chicago, a contract to install a Stewart coal-washing plant and mine tipple.

Work has been begun upon the site of the Port Arthur Wagon Works, Port Arthur, Ont.

The Lumby-Stenhouse Company's foundry building at Fort William, Ont., was destroyed by fire.

Work is shortly to commence on a $75,000 incinerator in Calgary, Alberta.

It is stated that the Superior Rolling Mills Company will begin the construction of its plant at Fort William, Ont., at once.

Charles M. Hays, president of the Grand Trunk Pacific Railway Company, says that company will build 545 miles of branch lines this year in the West.

The Pacific Coast

SAN FRANCISCO, May 31, 1911.

The demand for metal-working tools is again picking up, and while the market is still rather spasmodic there are indications of a gradual improvement. The sales of some dealers for the last three months have been about 25 per cent larger than for the same period last year. The oil interests are still among the principal buyers of the heavier types of tools, though the larger railroads are coming into the market to some extent, and a few tools have been purchased by the smaller local roads. One encouraging feature is the placing of orders for tools which have been needed for a long time.

The principal business now under way is the purchase of a lot of tools by the Standard Oil Company

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for its shops in southern California, some of which have already been ordered. The installation includes a plate-bending roll of fairly large size, several lathes and a number of smaller tools. This company is preparing to erect a large plant near Los Angeles, and is likely to be in the market for more equipment later in the year. It is believed that some tools will also be required before long for the shop at Richmond, Cal.

The Southern Pacific Railroad is arranging for the purchase of a lot of tools for its Los Angeles shop. Nothing of unusually large size will be required, but the installation will be one of the largest of the season.

Orders have recently been placed for a number of steam hammers and cranes, and several transactions of the same nature are now pending.

Most other lines of machinery are rather quiet, though there is considerable inquiry for second-hand equipment of all kinds, large machinery and contractors' supplies being more active than for some time past. If building operations around San Francisco Bay continue to increase there should be a good business in new concrete mixers. The Spring Valley Water Company is about to start work on one of the largest concrete dams in the State, and will probably be in the market for a lot of general equipment, including electric motors.

Laundry machinery has been in unusually strong demand for the last month, especially in southern California, where the change from a ten-hour to an eight-hour working day has made larger plants a necessity. From now on, however, no exceptional activity is anticipated in this line.

The demand for small pumping engines in this territory is unprecedented, practically all the shops in this line being operated at full capacity. In addition to the local demand, there is considerable foreign business, the Geo. E. Dow Pumping Engine Company having recently taken large orders for shipment to Chile. While there is some demand for municipal water-works plants, the principal business is in irrigating pumps, consisting almost entirely of small units. While gasoline still occupies an important position as motive power for irrigation, electricity is rapidly replacing it in all localities served by the hydro-electric plants in the Sierra Nevada mountains. Many motors are being installed in the Santa Clara Valley, where steam plants were formerly used.

The Pacific Gear & Tool Works, formerly at 1267 Folsom street, is moving into a new brick building at the corner of Folsom street and Columbia square.

The California Harbor Board is in the market for a number of pneumatic tools for use on the belt railroad in San Francisco.

The California Motor Car Company has leased a large building in Oakland, and is making tentative inquiries for a lot of machine tools.

The Central California Machine Works has been incorporated at Fresno, Cal., with a capital stock of $25,000, by C. M. and S. A. Heinsen, B. F., C. A. and G. Cathcart.

James P. Lucey has succeeded F. J. Fewings as president of the Consolidated Mfg. Company, which is working on a stove foundry project at Sunnyvale, Cal.

The Ideal Valve Grinder Company has been incorporated at Los Angeles, with a capital stock of $20,000, by N. E. Meredith, L. H. Schwaebe and L. A. Lothian.

An irrigating plant with a capacity of 180,000 gal. per hour is being installed by W. W. Muller at Maine Prairie, Cal.

J. Meklensen, Escondido, Cal., has secured a patent on a pumping device, and proposes to start a shop for its manufacture.

The town of Santa Rosa, Cal., has ordered an air compressor for the municipal pumping plant.

The Saline Valley Salt Company, organized to develop salt beds near Death Valley, Cal., is surveying for an 18-mile tramway to connect the property with the Southern Pacific.

The Associated Transportation Company is installing a new oil-heating plant on its pipe line near Salinas, Cal.

The Arizona Iron Works, Phoenix, Ariz., has been reorganized, the principal stockholders at present being A. M. Perkins, A. B. Duckworth and H. B. Duckworth, of Salt Lake City. It is planned to double the capacity of the plant, installing a new cupola and brass furnace.

The Government shop at Mare Island, Cal., is to build 30 launch engines of about 50 hp. this summer.

The city of Oakland, Cal., is taking bids on a ten-ton steam road roller.

It is reported that the Corliss Gas Engine Company, Petaluma, Cal., has secured additional capital and will proceed at once with the enlargement and improvement of its shops.

The Stearns Gas Engine Works has been incorporated at Los Angeles, with a capital stock of $40,000, by F. L. Stearns, E. M. Davis and J. R. Gilbert.

The National Oil Gas Producer Company has been incorporated at Los Angeles, with a capital stock of $900,000, by J. B. Merrill, D. B., G. and E. A. Merrill, J. E. and A. Mohl.

The Golver Iron Works, Stockton, Cal., has made arrangements to move its plant to Sacramento. The site to be occupied has connection with four railroad lines, and is more convenient to the mining districts, than the former location.

The Sacramento Electric, Gas & Railway Company, Sacramento, Cal., is preparing to erect a new power house.

The city of Oakland, Cal., is in the market for a steam roller.

It is reported that the Southern Pacific Railroad will start work before long on its new shops at Newark, Cal.

The Eastern Oregon Realty Company is planning the installation of a large pumping plant for irrigating purposes near Union, Cal.

J. B. Hodgdon, Seattle, Wash., has invented a new gold dredging device, and is negotiating with manufacturers of machinery at Olympia, Wash., in regard to manufacturing and marketing the article. It is understood that Mr. Hodgdon expects later on to start a shop of his own.

John Getty, N. P. Peterson and E. L. Neville are planning to start a box factory at Clarkston, Idaho.

The Frve-Bruhn Packing Company, Tacoma, Wash., is making arrangements for the erection of an ice and cold storage plant at Hoquiam, Wash.

It is reported that the Southern Pacific Railroad is working on a project to establish a briquetting plant in connection with a coal mine, near Marshfield, Ore.

Considerable machinery was destroyed by fire May 16 at the Multnomah County, Ore., rock quarry at Kelly Butte.

W. F. Boardman & Co., San Francisco, are working on a project to establish a gas plant at Klamath Falls, Ore.

A bond election will be held shortly at Sacramento, Cal., to provide for the expenditure of $200,000 in the increase of the pumping capacity of the municipal waterworks.

The Risdon Iron & Locomotive Works, of San Francisco, has filed articles of incorporation in this city, the capital stock being stated at $1,100,000. Wallace McCammant is the Oregon representative of the company.

Texas

AUSTIN, Texas, June 3, 1911.

The continued favorable prospects for a good crop season in Texas and the Southwest, together with a settlement of the revolutionary troubles in Mexico, is causing a general improvement in business conditions throughout this big territory. The demand for machinery of various kinds is very satisfactory, and it is expected that it will show a very material increase within the next few months. Many industrial prospects that have been held in abeyance are now in a fair way of being consummated. Unusual attention seems to be attracted to the establishment of new manufacturing plants and the installation of public utilities in the different towns and cities. The expected big increase in the demand for American-made mining machinery for Mexico has not yet developed, but it is anticipated that as soon as political affairs in that country are regarded in investment circles as being on a permanent basis this phase of machinery trade will assume much importance.

The National Lumber & Creosoting Company will install saw mills upon a large tract of hardwood timber near Mount Vernon.

The Alvarado Water, Light & Power Company is putting down an additional well to increase its water supply at Alvarado. It will make other improvements to its system.

Thomas Bradford, Pensacola, Fla., and W. C. Johnson, Timpson, Texas, will install a well-equipped machine shop at the latter place.

A new steel standpipe 16 ft. in diameter and 100 ft. high will be erected at Caldwell for the water works

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system. Bonds to the amount of $6000 have been voted for the purpose.

The Chamber of Commerce of San Antonio is negotiating for the establishment in that city of a cement brick plant to cost about $45,000 and which will have a capacity of about 40,000 bricks per day.

Steps have been taken by business men of Sealy to erect a cotton-seed oil mill there. Most of the proposed capital stock of the $40,000 has been subscribed.

John M. Thornton and associates will install a modern creamery at Caldwell.

The San Benito Sugar Mfg. Company has been organized at San Benito with a capital stock of $150,000. The incorporators are Alba Heywood, C. E. Barber and S. A. Robertson. The company is erecting a sugar mill.

The San Benito Canning Company has been formed at San Benito with a capital stock of $20,000. The incorporators are S. A. Robertson, John T. Lomax and W. B. Hinkly.

The Hondo Light, Power & Ice Company has been formed at Hondo with a capital stock of $24,000. The incorporators are J. H. Horn, Louis Schlentz and Jacob Fohn.

The Eureka Ice Company is the name of a corporation that has just been organized at Houston with a capital stock of $15,000. The incorporators are W. H. Kirkland, C. W. Fellows, O. L. Cochran and others.

The Hill Sugar Company, which is erecting a sugar mill at Harlingen, has filed its articles of incorporation in the Secretary of State's office. It has a capital stock of $300,000. The incorporators are Lon C. Hill, Gordon Hill and John D. Hill.

The Bryan Gas & Oil Company, which is preparing to develop the natural gas field near Bryan, has been formed with a capital stock of $20,000. The incorporators are A. A. Snell, J. K. Parker, J. W. Doremus and others.

The Commercial Motor Car Company will soon remove its factory from San Antonio to Houston. Z. Z. Brandon is president.

The Lee County Cotton Oil Company will make improvements to its cotton-seed oil mill at Giddings.

The electric light plant at Bastrop owned by F. Z. Bishop will be enlarged. The installation of an ice plant is also contemplated.

The Luling Electric Light & Power Company, of Luling, will enlarge and otherwise improve its plant.

The Coleman Mill & Elevator Company will install new machinery and enlarge its plant at Coleman.

Oil burners are being installed at the brick works of the Harlingen Brick Mfg. Company at Harlingen.

The Farmers' Gin Company has been formed at Heidenheimer with a capital stock of $25,000. The incorporators are J. W. Mosley, J. B. Marshall, T. H. Heard and others.

The Cameron Cotton Oil Company has been organized at Cameron with a capital stock of $60,000. The incorporators are R. L. Batte, J. S. Batte and A. H. Baskin.

The North Tigre Mining Company will install a 100-ton ore reduction mill at its mine near El Tigre, State of Sonora, Mexico.

The City Council has formally taken over the water works plant and distributing system at Tucumcari, N. M., and important improvements will soon be made to the property.

The Business Men's Club, of Tucumcari, N. M., is negotiating with Wichita, Kan., parties for the establishment here of a plant for the manufacture of concrete tile and conduits.

The Darbyshire-Harvie Iron & Machine Company, El Paso, is erecting an addition to its plant.

The Texas Steel & Iron Company, which is being organized by H. A. Fitch, president of the Kansas City Structural Steel Company, will be incorporated with $150,000 capital stock and will erect shops at Houston with a capacity of 1000 tons a month. It is expected that the plant will be ready for operation by November 1 of this year.

The Port Arthur Pleasure Pier Company, Port Arthur, is asking for bids for the erection of a bascule bridge across the Sabine-Neches Canal, the clear opening to be 90 ft. Also for a timber and concrete revetted causeway and plaza, the causeways to be 100 x 1900 ft. and the plaza 600 ft. sq. John W. Tryon is president of the company.

The J. R. Nutt Company, Fort Worth, has in course of erection an electric plant, the main building of which will be 133 x 208 ft., clear-story 55 ft. above basement, of brick and concrete construction with a smoke stack of reinforced concrete 250 ft. high. The company will install a complete electric equipment, automatic coal handlers, automatic stokers, etc. The total cost is estimated at $1,000,000. The Cleveland Construction Company, Cleveland, Ohio, is the engineer in charge.

Government Purchases

WASHINGTON, D. C., June 5, 1911.

The proposals for furnishing six 1,000,000-gal. pumps for Fort Mills, Corregidor Island, P. I., under date of May 24, has been modified so as to include bids for six 500,000-gal. pumps, two each under items 1, 2 and 3 of the specifications. Bids will be opened for these June 15 as previously advertised.

The quartermaster, Hot Springs, Ark., will open bids June 12 for enlarging the power house and equipment at the Army and Navy General Hospital.

R. J. Fleming, captain 10th Cavalry, Fort Ethan Allen, Vt., will open bids June 21 for building an addition to the pump house, installing electrically operated machinery and remodeling the electric lighting system.

The Paymaster General, Navy Department, Washington, will open bids June 20 for furnishing supplies to the engineering department as follows:

Class 11, one Watson-Stillman hydraulic forcing press for delivery to Mare Island, Cal. Class 62, eight motor driven back geared screw cutting engine lathes for Norfolk, Va., and Boston, Mass. Class 63, one extension boring and turning mill, and Class 67, for furnishing and erecting one locomotive crane complete at Washington.

The Isthmian Canal Commission opened bids May 27 for gate moving machinery. Various alternate bids for parts were received, the bids for the complete machines are as follows:

Class 1.—Two miter gate moving machines, one right and one left hand.—Bidder 1, Christiana Machine Company, Christiana, Pa., $62,520; 2, Exeter Machine Works, Pittston, Pa., $807,258.33; 3, Fawcus Machine Company, Pittsburgh, Pa., $660,643.52; 4, Mesta Machine Company, Pittsburgh, Pa., $765,240; 5, Power & Mining Machine Company, Cudahy, Wis., $862,237.57; 7, Rosedale Foundry & Machine Company, Pittsburgh, Pa., $702,750.40; 9, United Engineering & Foundry Company, Pittsburgh, Pa., $674,534.40; 10, Allis-Chalmers Company, Milwaukee, Wis., $741,085.74; 11, Otis Elevator Company, New York, $690,754.27; 13, Wheeling Mold & Foundry Company, Wheeling, W. Va., $652,064; 14, Westinghouse Machine Company, East Pittsburgh, Pa., $712,760.

Class 2, one miter forcing machine and spare parts—Bidder 2, Exeter Machine Works, Pittston, Pa., $65,591.69; 3, Fawcus Machine Company, Pittsburgh, Pa., $61,719.80; 5, Power & Mining Machine Company, Cudahy, Wis., $71,514.60; 6, Richard Mfg. Company, Bloomsburg, Pa., $41,275.50; 7, Rosedale Foundry & Machine Company, Pittsburgh, Pa., $51,587.70; 8, Union Machine Company, San Francisco, Cal., $63,488; 9, United Engineering & Foundry Company, Pittsburgh, Pa., $54,045.12; 10, Allis-Chalmers Company, Milwaukee, Wis., $55,207.30; 11, Otis Elevator Company, New York, $49,245.30; 13, Wheeling Mold & Foundry Company, Wheeling, W. Va., $50,914.; 14, Westinghouse Machine Company, East Pittsburgh, Pa., $49,952.80.

Class 3, two motors for gate moving machines and 90 motors—Bidder 10, Allis-Chalmers Company, Milwaukee, Wis., $38,820; 12, General Electric Company, Schenectady, N. Y., $39,308; 15, Westinghouse Electric & Mfg. Company, Washington, D. C., $56,028.

Class 4, one motor for forcing machine and 45 motors—Bidder 10, Allis-Chalmers Company, Milwaukee, Wis., $12,810; 12, General Electric Company, Schenectady, N. Y., $12,683; 15, Westinghouse Electric & Mfg. Company, Washington, D. C., $15,565.

Trade Publications

Electric Lamps and Generators.—Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. Two circulars. No. 1191 pertains to a line of multiple and multiple series metallic flame arcs which are designed for illuminating large areas such as parks, freight yards, mills, foundries, machine shops, etc. The construction of these lamps is described with considerable detail and the text is supplemented by numerous illustrations. No. 1194 relates to the type Q, engine-driven, direct-current interpole generators which are built in sizes ranging from 25 to 1000 kw. and for voltages of from 125 to 600. The special features of these generators, an illustrated description of which appeared in *The Iron Age*, April 27, 1911, are interpole construction, thorough ventilation and the combination of ruggedness with relatively light weight.

Valves.—Chapman Valve Mfg. Company, Indian Orchard, Mass. Catalogue No. 30; size, 6 x 9 in.; pages, 174. Shows a complete line of valves for a number of different purposes. The illustrations are supplemented by tables of specifications and in a number of instances line drawings showing the construction are included.

Metal Reels and Spools.—Frank Mossberg Company, Attleboro, Mass. Catalogue No. 101. Describes an extensive line of metal reels and spools which are made in a number of different sizes and styles for a variety of purposes. Space is also given to steel beams, measuring machines, metal stampings and punchings and wrenches.

CURRENT METAL PRICES.

The following quotations are for small lots, New York. Wholesale prices at which large lots only can be bought, are given elsewhere in our weekly market report.

IRON AND STEEL—

Bar Iron from Store—

Refined Iron:
1 to 1⅞ in. round and square.... ⎫ ₩ lb 1.70¢
1½ to 4 in. x ⅜ to 1 in..... ⎭
1½ to 4 in. x ¼ to 5-1 ..... ₩ lb 1.80¢
Rods—⅝ and 11-16 round and square. ₩ lb 1.80¢
Angles: Cts. ₩ lb.
3 in. x ¼ in. and larger.....1.90¢
3 in. x 3-16 in. and ⅛ in.....2.30¢
1¼ to 2½ in. x ⅛ in.....2.05¢
1½ to 2⅝ in. x 3-16 in. and thicker....1.95¢
1 to 1½ in. x 3-16 in.....2.05¢
1 to 1¼ x ⅛ in.....2.10¢
⅞ x ⅛ in. .....2.20¢
⅝ x ⅛ in. .....2.25¢
⅝ in. x ⅛ in.....3.45¢
½ x 3-32 in. .....3.90¢
Tees:
1 in. .....2.35¢
1¼ in. .....2.20¢
1½ to 2½ x ⅛ in.....2.00¢
1½ to 2½ x 3-16 in.....2.10¢
3 in. and larger.....2.95¢
Beams .....1.90¢
Channels, 3 in. and larger.....1.90¢
Bands—1½ to 6 x 3-16 to No. 8.....2.10¢
"Burden's Best" Iron, base price.....3.15¢
Burden's "H. B & S." Iron, base price.....2.95¢
Norway Bars.....3.60¢

Merchant Steel from Store—

per lb
Bessemer Machinery.....1.90¢
Toe Calk, Tire and Sleigh Shoe.....2.50@3.00¢
Best Cast Steel base price in small lots.....7¢

Sheets from Store—

Black,

	One Pass, Soft Steel.	C.R. Cleaned.	R. G.
No. 16	₩ lb 2.55¢	2.80¢	
Nos. 18 to 20	₩ lb 2.70¢	2.90¢	
Nos. 22 and 24	₩ lb 2.75¢	3.00¢	
No. 26	₩ lb 2.80¢	3.10¢	
No. 28	₩ lb 2.95¢	3.30¢	

Russia, Planished &c.

Genuine Russia, according to assortment .....₩ lb 12 @14½
Patent Planished, W. Dewees Wood.....₩ lb A. 10¢; B. 9¢ net

Galvanized

Nos. 12 and 14.....₩ lb 2.95¢
Nos. 22 to 24.....₩ lb 3.30¢
No. 26.....₩ lb 3.50¢
No. 28.....₩ lb 3.80¢
No 20 and lighter 36 inches wide, 25¢ higher.

Genuine Iron Sheets—

Galvanized

Nos. 22 and 24.....₩ lb 5.75¢
No. 26.....₩ lb 6.25¢
No. 28 .....₩ lb 7.25¢

Corrugated Roofing—

2½ in. corrugated.	Painted.	Galvd.
No. 24.....	₩ 100 sq. ft...$3.85	$4.80
No. 26.....	₩ 100 sq. ft... 2.95	4.00
No. 28.....	₩ 100 sq. ft... 2.60	3.75

Tin Plates—

American Charcoal Plates (per box)

"A.A.A." Charcoal:
IC, 14 x 20.....$6.65
IX, 14 x 20..... 7.90
A. Charcoal:
IC, 14 x 20.....$5.60
IX, 14 x 20..... 5.70

American Coke Plates—Bessemer—
IC, 14 x 20.....107 lb.....$4.50
IX, 14 x 20..... 5.50

American Terne Plates—
IC, 20 x 28 with an 8 lb. coating.....$8.70
IX, 20 x 28 with an 8 lb. coating.....10.70

Seamless Brass Tubes—

List November 13, 1908. Base price, 18¢

Brass Tubes, Iron Pipe Sizes—

List November 13, 1908. Base price, 18¢

Copper Tubes—

List November 13, 1908. Base price, 21¢

Brazed Brass Tubes—

List February 1, 1911. 19¾¢ ₩ lb

High Brass Rods—

List February 1, 1911. 14¼¢ ₩ lb

Roll and Sheet Brass—

List February 1, 1911. 14¼¢ ₩ lb

Brass Wire—

List February 1, 1911. 14¼¢ ₩ lb

Copper Wire—

Base Price, Carload lots mill 13¾¢

Copper Sheets—

Sheet Copper Hot Rolled, 16 oz. (quantity lots) ..... ₩ lb 18¢
Sheet Copper Cold Rolled, 1¢ ₩ lb advance over Hot Rolled.
Sheet Copper Polished 20 in. wide and under, 1¢ ₩ square foot.
Sheet Copper Polished over 20 in. wide, 2¢ ₩ square foot.
Planished Copper, 1¢ ₩ square foot more than Polished.

METALS—

Tin—

Straits Pig..... ₩ lb 47½@48 ¢

Copper—

Lake Ingot .....₩ lb 14 @14¼¢
Electrolytic .....₩ lb 13¾@14 ¢
Casting ..... ₩ lb 13¾@14 ¢

Spelter—

Western ..... ₩ lb 6¼@ 6⅝¢

Zinc—

No. 9, base, casks.. ₩ lb 7¾¢|Open.. ₩ lb 8¼¢

Lead—

American Pig..... ₩ lb 5 @5¼¢
Bar ..... ₩ lb 6¾@6⅞¢

Solder—

½ & ½, guaranteed..... ₩ lb 27 @27½¢
No. 1..... ₩ lb 25 @25½¢
Refined ..... ₩ lb 22¾@23 ¢
Prices of Solder indicated by private brand vary according to composition.

Antimony—

Cookson ..... ₩ lb ..@10¼¢
Hallets .....@10¼¢
Other Brands .....@ 9¾¢

Bismuth—

Per lb $2.00@$2.25

Aluminum—

No. 1 Aluminum (guaranteed over 99% pure), in ingots for remelting.....21¢ and 23¢
Rods & Wire.....Base Price 31¢
Sheets .....Base Price 33¢

Old Metals—

Dealers' Purchasing Prices Paid in New York.

	Cents.
Copper, heavy and crucible	10.50 to 10.75
Copper, heavy and wire	10.25 to 10.50
Copper, light and bottoms	9.25 to 9.50
Brass, heavy	7.00 to 7.25
Brass, light	5.50 to 5.75
Heavy machine composition	9.00 to 9.25
Clean brass turnings	6.75 to 7.00
Composition turnings	7.75 to 8.00
Lead, heavy	3.75
Lead, tea	3.50
Zinc, scrap	4.00

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